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Rock Products

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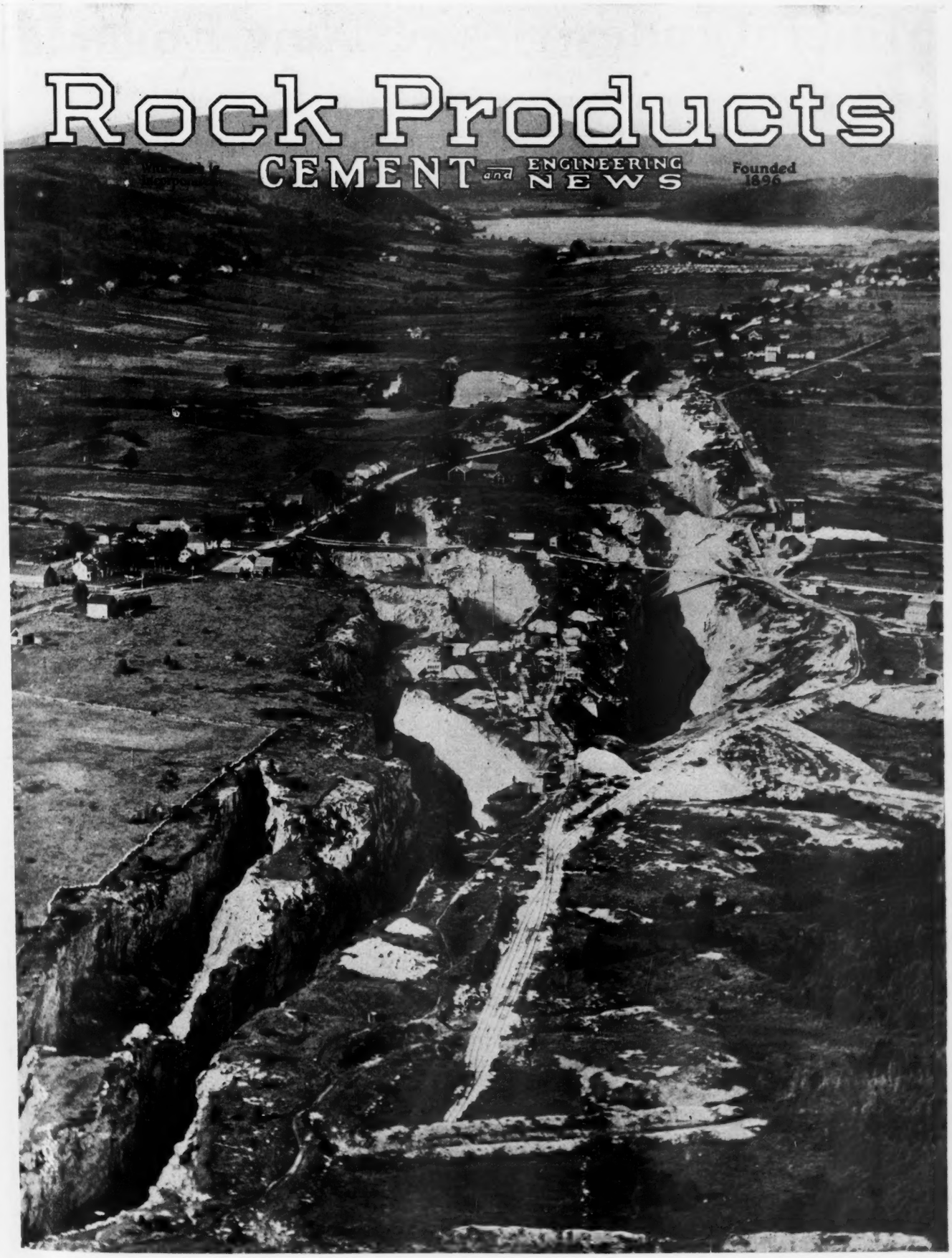

One of the most famous limestone quarry operations in the world—seen from an aeroplane—the quarries of the Rockland and Rockport Lime Corp., at Rockland, Maine

Mineral Industries of New England*

Stone Production Ranks High

By Oliver Bowles
U. S. Bureau of Mines, New Brunswick, N. J.

NEW ENGLAND is not generally regarded as a mining territory, because the term "mining" in its popular interpretation has always been associated with coal or metal production. In these respects New England is notably weak. It is significant that in compiling figures for mineral production from Bureau of Mines statistics I failed to find a single figure for any New England metal. Whatever production there may be is included in the miscellaneous group.

This does not mean, however, that New England mining is of small importance. The total production of the six states in 1925 approached $55,000,000, which is a fair showing in view of the almost complete absence of coal, petroleum, gas or metals. The mineral resources of New England are pre-eminently nonmetallic, and are confined chiefly to structural materials, such as stone, clay products and lime.

A typical New England granite quarry at Barre, Vt.

The accompanying table compiled from Bureau of Mines publications gives the production value of the New England states in 1925. It is significant that these states take the lead in several important commodities. Massachusetts stands first among all the states of the Union as a granite producer, with Vermont second, Maine fifth and New Hampshire ninth, the New England states producing 45% of the United States' total. The great granite industry of Barre, Vt., was hard hit by last year's flood, but with characteristic energy and resourcefulness the difficulties standing in the way of normal production have been almost overcome. In marble production, Vermont stands first, Vermont and Massachusetts together producing 38% of the United States' total. In trap rock production, Connecticut is third and Massachusetts sixth, and in feldspar New Hampshire is second and Maine third, North Carolina being the leading state in this mineral. In slate production, Vermont stands second, and if we include the adjacent New York territory, which forms a unit with the Vermont deposits, production value exceeds $4,000,000 per year, and closely approaches that of Pennsylvania. Maine stands fourth as a slate producer. New Hampshire is now first as a mica mining state, having recently outstripped North Carolina, which for many years was the chief producer. Vermont is second in the production of talc. Thus in nine instances the New England states rank either first, second or third in the order of production of important nonmetallic minerals. It may be added that a large cement plant, the first and only one in New England, is now in operation at Thomaston, Maine.

Possible Expansion

With this picture of New England mining before us let us analyze the situation from the standpoint of possible future expansion. The industries are substantial and permanent. Granite stands for solidity and endurance, marble for architectural beauty and dignity, slate for durability and attractiveness, the crushed stones that enter concrete buildings and road construction are fireproof, weatherproof and thus permanent in character. Clay products, sand and gravel and lime are likewise associated with that type of construction that will bear the weight of years. Mica, so essential in electrical equipment, is bound to become of greater and greater importance in this electrical age. These New England minerals as a whole are essential in industry, and there is little prospect of a diminishing demand for them, except insofar as competition with substitute materials may affect the market requirements of the consumer.

What are the conditions upon which expansion of these industries depend? A first and very important step in this direction is to lower production costs. The consuming public manifests distinct opposition to high prices, and there is a tendency to use lower

MINERAL PRODUCTION OF NEW ENGLAND—1925
(Compiled from Bureau of Mines Mineral Resource Figures)

Commodity	Maine	New Hamp.	Vermont	Mass.	R. Island	Conn.	Total
Granite	$2,774,707[5]	$1,712,138[9]	$3,705,624[2]	$4,156,762[1]	$583,960	$764,657	$13,697,848
Marble	.....	.....	5,144,467[1]	189,574	.....	.....	5,334,041
Limestone	95,735	.....	108,755	347,177	.....	.....	551,667
Sandstone	.....	.....	.....	.....	.....	40,327	40,327
Trap	.....	.....	.....	1,291,751[6]	.....	1,764,645[3]	3,056,396
Misc. stone	.....	.....	.....	655,069	140,468	85,710	881,247
Total stone	(2,870,442)	(1,712,138)	(8,958,846)	(6,640,333)	(724,428)	(2,655,339)	(23,561,526)
Clay and clay products	625,969	828,541	108,008	3,820,702	.....	2,516,230	7,899,450
Feldspar	256,731[3]	278,736[2]	.....	.....	.....	71,201	606,668
Lime	1,291,812	.....	788,936	2,610,279	.....	672,821	5,363,848
Sand and gravel	155,014	316,248	35,608	3,116,323	45,157	463,807	4,132,157
Slate	604,062[4]	.....	3,963,025[2]	.....	.....	.....	4,567,087
Mica	.....	246,383[1]	.....	.....	.....	.....	246,383
Talc	.....	.....	533,603[2]	.....	.....	.....	533,603
Miscellaneous	38,942	82,791	30,351	5,443,850	1,803,150	382,559	7,781,643
Total	$5,842,972	$3,464,837	$14,418,377	$21,631,487	$2,572,735	$6,761,957	$54,692,365

(Subfigures indicate rank of state in production value for the entire country.)

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Paper presented at the April, 1928, meeting of the Boston Section of the A. I. M. E.

priced commodities even at the expense of permanence. To meet keen price competition industry as a whole is seeking means of lowering production costs.

The National Research Council through its division of engineering and industrial research has made a survey through a questionnaire of the research work being carried on in the United States. Almost without exception the reply has been that research is being primarily directed toward reduction in the cost of production. The New England mineral industries must stand in the forefront in this movement, otherwise competitors who are attaining lower costs will handicap them more and more.

Quarrying is an ancient industry which was conducted in the early days by very primitive methods. Conservatism has opposed and prevented the acceptance of improved methods and equipment in many quarries, and, therefore, the industry has not kept in step with modern progress. There has been an awakening in some branches, but a more general acceptance of modern methods is desirable. Progress in the metallurgy of iron, steel and other metals has far outstripped the progress along similar lines in the non-metals. To remedy this condition it is desirable that a closer unity should prevail between mining engineers and the quarry industries. These industries should utilize more fully the accumulated experience of the metal miner and the metallurgist; and the mining engineer should familiarize himself more fully with the manifold problems and complexities of nonmetallic mining and primary manufacture. Recently it has been found that hydraulic classification of sand and gravel has advantages over screening, but the best results by this new method can be expected only where the sand plant operator utilizes the knowledge of hydraulic classification accumulated through many years of study and experimentation by the metallic ore dresser. It is important that these matters should be discussed. Such gatherings as this should multiply and they should afford a meeting ground where fundamental problems of this nature can be viewed from every angle.

Co-operation of Bureau of Mines

The Bureau of Mines has been endeavoring to reduce production costs in the non-metallic industries by encouraging the use of the most efficient methods and machines. Lately our attention has been directed toward the slate industry. A little over a year ago the Nonmetallic Station of the Bureau of Mines, at New Brunswick, N. J., induced Pennsylvania operators to co-operate with the bureau in experiments with the wire saw. Conservatism at first tended to condemn the trial, but with the co-operation of a few of the more progressive men the tests were conducted, and within a few weeks the new method had so proven its success that equipment orders were placed by several companies. The ¼-in., 3-strand cable runs as an endless belt and is fed with sand and water. One such cable has in a period of 37 hours continuous cutting time without interruption, supervised by one man only to each shift, cut as much slate as would under the old method require two men over a period of three weeks using much more costly equipment. Furthermore, the new method has greatly reduced the wastage of slate. The advantages in cost and waste reduction are so apparent that six operators are now using wire saws in their quarries, and two others have within the last month ordered complete equipment. During the present summer the method is expected to be in general use in Pennsylvania.

Marble storage yard at Procter, Vt.

New England with adjacent New York produces nearly half the slate in the country, but New England has not as yet tried out the wire saw. The Vermont Marble Co. is, however, experimenting with the wire saw in its marble quarries at West Rutland.

This one type of equipment illustrates the possible improvements in processes with lowering of costs and conservation of waste sometimes easily possible. The opportunity for cost reduction through improvement in process is great, and demands the earnest consideration of all thoughtful operators.

The inquiry made by the National Research Council, to which previous reference has been made, brought out the fact that next in importance to cost reduction is research on the improvement of quality. A dependably uniform high-grade product is the best advertisement and it is also the best insurance for a continued market demand. The producer should rightly take pride in the quality of the finished product, and in the structures in which it is employed. It is to his interest that these structures be permanent, attractive and that they fulfill in every respect the purpose for which they are designed. Occasionally structures that should be permanent in character have failed, and such failure reflects in some measure, directly or indirectly, on the quality of the raw materials derived from mines and quarries. The responsibility rests upon the producer only where his products are inferior, and no effort should be spared to overcome inferiority. If failure is due to faulty engineering or poor workmanship in fabrication of the finished product, producers of the raw materials may rightly feel that the responsibility is not theirs, but nevertheless they should have a vital interest in throwing their

A marble block storage yard with a 50-ton crane at West Rutland, Vt.

influence toward the maintenance of a high standard of excellence in all products in which their materials are used. Roofs of slate that will weather the storms of centuries, marble or granite buildings and memorials of beauty and permanence, concrete structures and highways that will stand up under the severest strain, these are the products back of which the mineral industries of New England stand, and quality is the essential upon which their good name depends.

Changes in Crushed Stone and Gravel Industries

In the crushed stone and the sand and gravel industries there is much room for improvement in sizing and in handling materials. Trommels are being replaced with

A Maine granite quarry excellently located for water transportation

advantage by roller or disc grizzlies for the coarser sizes, and vibrating screens are demonstrating their efficiency for the finer sizes. As previously mentioned, hydraulic classification adapted from the metal ore-dressing industry is taking the place of screening in some sand and gravel plants. Belt conveyors are finding wider use. Are the New England industries keeping pace in these advancements?

One of the greatest problems facing the nonmetallic mineral producer is transportation. Transportation affects the mica miner in a lesser degree because both sheet and scrap mica command a price sufficient to justify their haulage for long distances. The rock industries, however, face a serious problem in transportation, for rock is a large-tonnage, comparatively low-priced commodity. The transportation charge is in many instances the chief item in the total cost at the place of utilization, it may indeed exceed all the other items combined. The largest items of cost are those that demand the most careful scrutiny, and they are the items that will probably yield the greatest return for effort directed toward their reduction. Transportation should, therefore, occupy a primary place in any effort directed toward an expansion of these New England industries.

Possibly no human activity has seen greater advancement than transportation of materials. Land transportation has evolved from the human laborer, the pack mule and the horse drawn cart to the express train and the motor truck; and some quarries, perhaps through force of circumstance, are still using horse-drawn vehicles. Transportation by water has generally shown advantages over that by land. This was particularly apparent before the age of improved highways, but its advantages are still in evidence, and it has made great advance during the past 10 or 15 years. Loading from chutes or by belt conveyors has reduced the loading time to a minimum; improved machinery and ship design have increased the speed of travel, and the development of the self-unloading ship has greatly simplified the discharge of the cargo.

A figure which I have commonly obtained for transportation of stone by horses, or even by motor trucks, over unimproved highways is 20 cents per ton mile. The modern self-unloading Great Lakes freighter has converted this into a figure which reads 20 ton miles for a cent, or one 4/100 of the horse-drawn vehicle cost, or even of a motor trucking cost over unimproved mountainous roads.

An Opportunity to Use Water Transport

In the light of these notable developments, I wonder if New England is utilizing as fully as it might the facilities for water transportation. The forbidding rock bound coast was a barren wilderness to the early settlers, but these same rocky promontories are now providing valuable materials for industrial use. Many important mineral producing centers are in close proximity to the coast, the granites of Crotch Island and Stonington, the great lime industry at Rockland, Maine, and the cement industry soon to reach a producing state, the high-grade monumental granites of Quincy, Mass., of Westerly, R. I., and Cape Ann, all are adjacent to the Atlantic coast. Coastal shipping is now employed, but is there room for development of the newer and more efficient types of shipping now used on the Great Lakes? The great cities at the eastern harbors of America offer enormous markets for quarry products, and the markets will be most available to those products that can be delivered at the lowest cost. Since transportation is of paramount importance, should not some central agency representing all the coastal mineral industries of New England make a careful inquiry into the present cost of water haulage and the possibilities of accomplishing material reductions in such cost?

The inland quarries cannot of course reap equal advantage through possible improvement in coastal shipping, but their transportation conditions are being constantly improved chiefly through the building of highways. Improved hard-surfaced roads have in effect shortened distances immeasurably, and have greatly reduced the ton-mile cost of conveying quarry products to their markets. Extensive highway programs are usually welcomed, though the taxpayer may at times raise some objection. However, the advantage generally far outweighs the cost. Certainly improved highways are of double advantage to the rough stone quarrymen. Every new artery of traffic extends the boundary of his local market, and connects him more readily with the great trunk lines or waterways that lead to the more distant markets. And not only are his facilities for transportation increased, but every mile of new highway consumes thousands of tons of rock, sand, gravel and cement, the very commodities that he has to sell.

Changing Tastes Affect New England Stone Industry

Another great problem that every mining industry must face is diminishing demand for certain classes of commodities owing to changes in methods of utilization. The extensive use of concrete has had a depressing effect on the production of the cheaper grades of building stones. This is compensated to some extent by the increased demand for aggregate, and the producer is fortunate who can adapt his industry to this changed demand.

The use of concrete in streets and highways has prevented expansion of the paving block industry. The discontinuance of many trolley lines has further reduced the demand for stone blocks to pave between tracks. When it becomes evident that the paving block industry, which has been of great importance especially in Maine, can no longer maintain its former volume, it is time to give serious thought to modifications whereby the producer may cater to the changing circumstances. If the demand for aggregate increases while that for paving stones decreases, cannot crushing and screening plants be established at the coastal quarries from which aggregate can be shipped at low cost by water to the great aggregate consuming

centers which are nearer to these northern quarries than are the blast furnaces of Chicago and Buffalo to their limestone supply?

Many industries have awakened to the necessity of keeping in touch with every new development. A new invention may destroy a great industry over night. The radio almost ruined the phonograph industry, but the phonograph manufacturer refused to accept defeat, and partly through the invention of the orthophonic reproducer the phonograph is coming back. Fortunately the nonmetallic mineral producer is not confronted with the prospect of any sudden or profound change in use that will threaten his operation with sudden disaster. However, there are trends and tendencies that must be watched, changes in modes of utilization that may be slow but are irresistible, and the wise industry is the one that adapts itself to the changed conditions before calamity overtakes it.

New England has never given sufficient emphasis to its mining. There has been no active demand for governmental study, or for the organization of definite research programs by the industries themselves. This attitude should be revised. The industries are now of importance to every citizen; potentially their importance is vastly greater. We hear occasional reference to northern industrial enterprises migrating southward in search of cheaper labor. The mining industries, however, cannot migrate; they constitute a natural heritage of the northeastern states; they may languish, but their raw materials are deeply rooted in the hills and valleys of New England, if they develop at all they must develop here.

I have briefly mentioned some of the problems that are worthy of consideration, many others may be apparent to you, still others have not yet appeared on the surface. It is important that more systematized and unified study be given to them. Though undoubtedly many difficult barriers to a wider development may appear, engineering skill and ingenuity can break them down; but it is of supreme importance that the industries themselves should encourage and co-operate with the engineer, the geologist, the metallurgist, the chemist and the economist in whatever they may undertake to promote efficiency or to improve industrial or economic conditions.

Future Rock Products Industry —Billions in Oil Shale

KENTUCKY has three separate and easily recognizable bituminous shales or groups of shales, according to Dr. Willard Rouse Jillson, state geologist. That of Estill county is in the Chattanooga or Ohio black shale group. In 21 distillation tests of Kentucky shale from various counties, Estill's shale made the second best record, yielding 22 gal. of oil to the ton of shale. Only that of Taylor county exceeded it in yield.

A Geological Survey map shows the presence of shale deposits in a roughly semicircular vein from Lewis county, on the Ohio river, on the east, up through Fleming, Rowan, Bath, Montgomery, Powell, Clark, Estill, Madison, Garrard, Lincoln and Casey, down through Taylor, Boyle, Marion, Larue, Nelson and Bullitt to Jefferson and Oldham on the river again, and also in other sections to a less extent.

Geologist Jillson estimates that there are more than 600,000 acres of commercially important shale outcrop in Kentucky, so far discovered. Even if the average oil content were 16 gal., as indicated by the Jillson experiments, the possible recoverable content would be more than 12,000,000,000 bbl., which at $5 a barrel would be more than $60,000,000,000. And Dr. Jillson insists that these figures are conservative.

When the comparatively easier method of obtaining oil by drilling shall slacken, here, indeed, is another obvious source of wealth. —*Louisville* (Ky.) *Courier-Journal.*

Technical Development of Japanese Cement Industry

By Dr. C. R. Platzmann
Hamburg, Germany

THE YEAR 1927 seems to have been the jubilee par excellence of the portland cement industry. Besides the Association of German Portland Cement Manufacturers, which celebrated its 50-year existence; besides the American Portland Cement Association, which could look back upon a 25 years' work, one-half century had also passed since in 1877 the Japanese government called the first cement works into existence in Tokyo. This plant was the first of a group, in 1890, from which has emerged the contemporary Asano Cement Co., as the largest cement manufacturing concern in Japan. There are at present 24 concerns with 34 plants, which have available a producing capacity of possibly 22,000,000 bbl. of 170 kg. (375 lb.) each, and which produced 18,000,000 bbl. in 1926.

So far as concerns the technical development of the Japanese cement industry, it is first of all evident that the country has available abundant and good deposits of limestone. Since 1915 the black lime accumulating in the manufacture of sulphuric acid ammonia has been utilized with success as a raw material for the cement industry. In the first place clay, and in the second place shale, is used generally as the source of the silicic acid-containing and argillaceous earth-containing raw materials. Pyrite slag as a by-product in the manufacture of sulphuric acid serves extensively as a source of the iron oxide. The utilization of the coal ash as a constituent of the raw material mixture is generally customary. A few plants use the gypsum imported from Germany, France or Italy, whereas the Japanese gypsum is in general of an inferior grade and of irregular quality. In spite of this it is used by the majority of the plants. Also all the forms of gypsum from the ceramic industry and the calcium sulphate accumulating in the manufacture of acetic acid serve the same purpose.

For a long period the rotary kiln has been installed exclusively in place of the shaft kiln. Exclusive of a few plants which operate with the wet process, the dry preparation of the raw materials is in general customary.

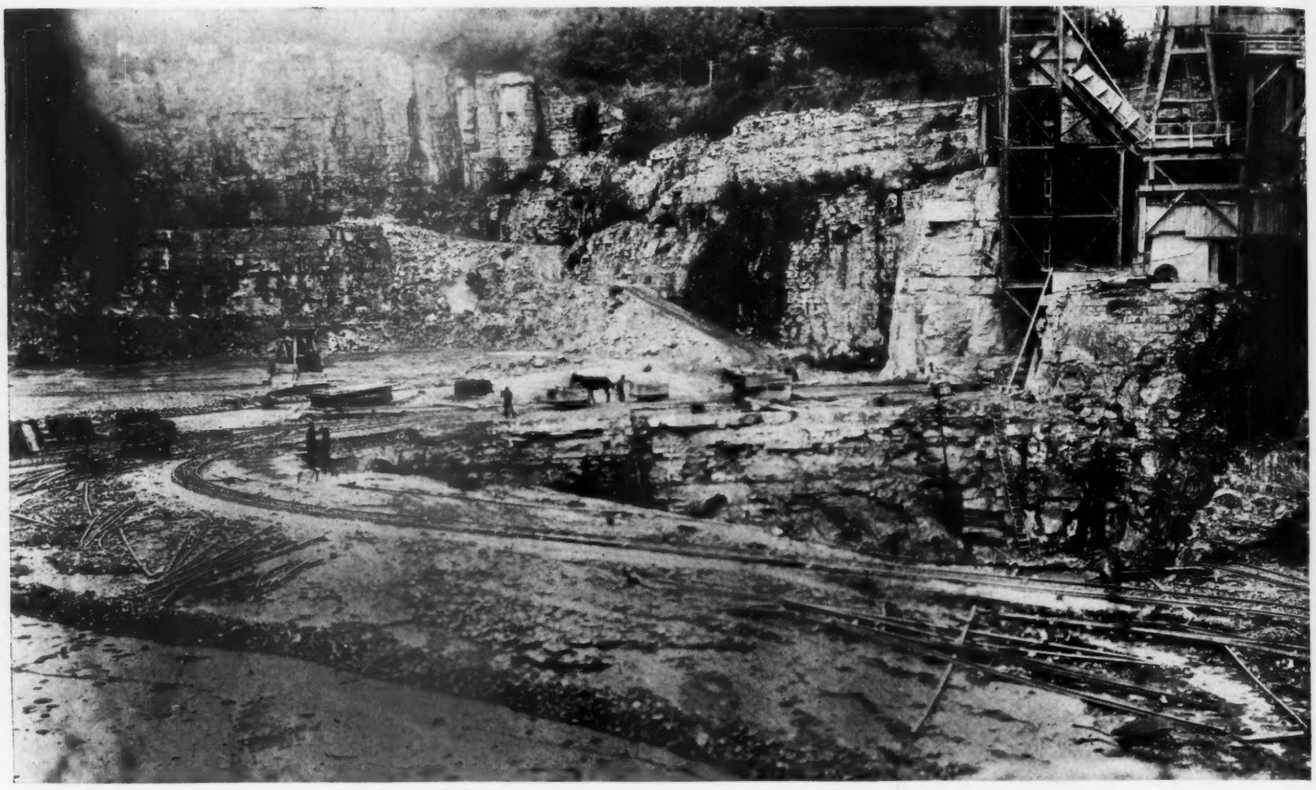
For milling the raw materials and the clinker, tube and ball mills are still generally in operation; compartment mills with several chambers and air separation, the largest of which is 24 ft. long and 7 ft. in diameter, are rapidly on the way to displace all other milling systems. Whereas in the past all machinery was imported from Germany and the United States, recently the machinery is frequently manufactured in Japan.

Powdered coal serves exclusively as the fuel, since petroleum is not sufficiently cheap and natural gas is not available in sufficient quantities.

The reclaiming of energy by means of waste-heat boilers and turbo-generators has been introduced in many plants; a few have available also Cottrell and Oski precipitation installations for electrical extraction of dust.

The quality of the Japanese cement has increased steadily, especially since 1918. The first standards issued by the government date back to the year 1905. These have been revised in 1913 and also in 1919. The latest reissue appeared in 1927 upon the suggestion of the Japanese Portland Cement Association. Prof. S. Nagai of the University of Tokyo has investigated eight different cements in 1926 and 12 in 1927 and obtained thereby the following average strengths, from which an approximate conclusion concerning average quality appears justified.

Mixture 1:3		Tensile Strength lb. per sq. in.			Compressive Strength lb. per sq. in.	
Days:	2 or 3	7	28	2 or 3	7	28
Per standard		>199.1	>298.7			>2986.9
1926	2 days 280.2	384.0	472.2	2 days 2674.0	4807.5	6187.2
1927	3 days 374.1	408.2	459.4	3 days 4679.5	6215.7	7532.6



The quarry of the Edward Hely Stone Co. at Cape Girardeau, Mo., showing the second level and the large skip for bringing stone to the surface, and, at the right, the beginning of the lowest level

The Quarry Industries on the Mississippi River Below St. Louis

Flood Control Works Require Quarries To Supply Rip-Rap as Well as Crushed Stone—The Lime Industry of Ste. Genevieve, Missouri

By W. B. Lenhart
Assistant Editor, Rock Products

A RECENT EDITORIAL TRIP covered the territory of southern Illinois and Missouri, immediately adjacent to the Mississippi river, the Valmeyer plant of the Columbia Quarries Co., being the most southerly operation on the Illinois side of the river; and on the west side of the river the trip included the lime areas of Ste. Genevieve and Cape Girardeau, Mo., and as far south as Batesville, Ark.

The crushed limestone quarries of this section were all busy and operating 10 to 12 hours per day. In some cases occasional two 9-hour shifts were necessary to keep up with the demand, although it was not anticipated that many of these long days would be necessary.

Practically all this rock was going into highway construction, most shipments being by rail, although some tonnage was being hauled by truck, and in one instance crushed rock was being loaded on barges for haulage on the river. The Valmeyer production, on the other hand, was entirely for metallurgical stone for blast furnaces and other chemical uses. None of this quarry's rock is used for highways.

There is evidently ample plant capacity for all the needs of the territory at present. In some quarters fears were expressed that with Illinois state appropriations for highway construction drawing towards the final chapter, and no new appropriations in sight, there may be a decided over-capacity in prospect.

The tonnage of several of the operators can be increased materially very easily should any unforseen developments arise whereby they would be called on for a continued larger tonnage.

The crushed stone producers in southern Illinois, with quarries in the vicinity of East St. Louis, Ill., ship all their rock to Illinois points, very little being shipped across the river into Missouri. This is on account of the 50 c. per ton charge for transportation over the river. A small tonnage is shipped by truck from the Casper Stolle Quarry and Contracting Co. plant via the city-owned bridge, over which there is no toll charge. The East St. Louis companies can compete only in the downtown sections of St. Louis proper.

Unreliable Electric Power

One thing very noticeable at the crushed-stone plants using purchased electric power was the uncertainty of power delivery. At

four different quarries visited over a period of a week the power was off at each of the above plants, while I was there, for periods of from a few minutes to several hours. This is very poor service, to say the least, and does not compare with service on the Pacific coast, where the writer operated several years and where, if electric power failed four

Clearing out the crusher is one of the things that must be done when the power fails; Edward Hely company

times in a year, it would be considered unusually high.

Where a stone quarry has several crushers, the initial unit having at times as high as 20 tons of large sized stone dumped into it, one can see what a serious matter it is to have the power off, even for a few minutes, for most of this rock has to be removed by hand before the crusher can start. These interruptions were invariably without any previous notice. At one plant they were all set to make a record production for the day when about 11:30 a. m. the power failed and was off about two hours. This loss in production is a serious matter to the operators in the district during their busy season, and the electric power companies should be impressed with the necessity of uniform, steady power delivery if they expect to find further sale for their power in the rock industry.

Rock for River Work

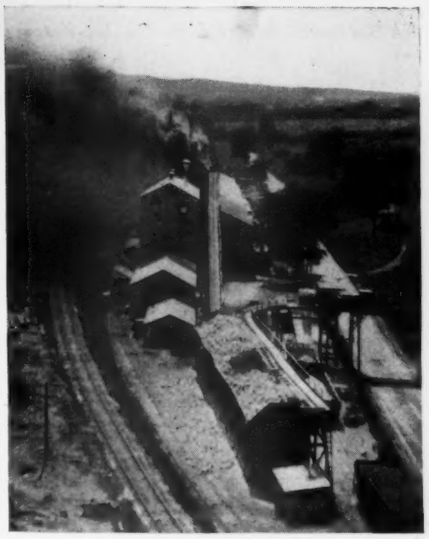
Along the west side of the Mississippi river, scattered at frequent intervals, are many small quarries getting out rip-rap for river work. No stops were made at any of these smaller quarries, although from the train there could be seen plenty of evidence of activity. During the trip up and down the river between Ste. Genevieve and Cape Girardeau there were perhaps 30 to 40 barges being loaded, unloaded or in process of being transported down the river.

Whenever it is possible, the empty barges are pushed up the river to the quarry and return loaded with the stream. Steam-driven, stern wheelers, mostly owned by the United States government, push the barges, although in one case a new Diesel-engine powered stern wheeler was noted.

The rip-rap, owing to the nature of the material, is all loaded for transportation to the barges by hand. Only the "one-man" sized rock is used. The spalls are wasted.

The bluffs from which this class of rock is quarried are parallel to the Frisco lines connecting St. Louis with Memphis and are very close to the right-of-way—in some instances less than 50 ft., and as it is impossible in most cases to go over or under the railroad tracks, transportation to the barge docks is by means of carts, wagons, stone boats and in some cases by wheelbarrows. The total distance that the rock is hauled is from a hundred yards to roughly one-quarter mile.

The barges are all of steel construction, consisting simply of a flat-decked hull, and they have a top area of about 50x150 ft. There were several sizes noticed. The barges hold upwards of 600 tons of stone each. When empty these barges draw about 18 in.



Plant of the Bluff City Lime Co., Ste. Genevieve, Mo., from the top of the Peerless White Lime Co. kiln

of water, but when loaded to capacity they draw 5 to 6 ft.

There are no elaborate docks for mooring the barges to the place of loading; they are simply lashed fore and aft to "dead men" buried well back from the bank or to the concrete footings of the stiff-leg derricks.

Loading from bank to barge is done invariably with a stiff-leg derrick with a mast and boom of sufficient length to load two barges placed alongside each other at the same time. These derricks were operated by steam driven hoists in most cases. The derrick (by means of a sling) picks up the body of the cart, wagon or whatever is used for haulage and dumps the rock on the barge. The rock is then piled in neat tiers around the outer edge of the boat to a height of about 4 ft., and the center is filled with the balance of the cargo. Care must be taken to distribute the load over the area evenly as loading progresses so as to keep the barge on an even keel.

The use to which this rock is being put is in no way connected with the recent $325,000,000 congressional flood-control appropriation, but is the regular river "revetment and hurdle" work. This work has been progressing for a number of years, but can only be done when the river is at a reasonably low stage.

At points in the river where the channel is wide or where there is a series of water courses separated by islands, it is sometimes necessary to divert practically the entire flow of water to one channel. This is usually done by what are known as hurdles. Long narrow mats of wood are constructed and floated to a position usually at right angles to the banks. These are sunk by loading with stone, after which piling is driven through the mats at centers of 6 to 10 ft. The tops of the piles are cut off so as to be about 4 ft. above the low-water mark, thus in flood periods the water passes over the structure.

There usually will be several of these hurdles in series, one being built about every 200 yd. along the river. The number will of course depend on local conditions.

The idea in constructing them after this fashion is that the rock mats prevent cutting under the piling, and the balance of the structure acts as a lodging place for brush, which soon builds up to a diversion dam. By keeping the top below flood water there is less likelihood of their being washed away.

A Typical Rip-Rap Quarry Operation

At the Edward Hely Stone Company's plant, at Cape Girardeau, which is perhaps one of the largest producers of rip-

The Ste. Genevieve Lime Co. plant, from the top of the Peerless kiln

rap on the west side of the river, the rock is quarried from a small pit a few hundred yards north of the crushed-stone quarry operations. (The crushed stone plant will be described later in this article.)

This quarry is shallow, being about 30 ft. deep, oval shaped and not over 200

Plant of the Batesville White Lime Co., at Batesville, Ark.

yd. in length. The rock is drilled with tripod, Sullivan J-R air drills and shot with no special method of loading or shooting as the operation is comparatively small. This quarry was used as a source of crushed stone prior to 1910 when it was abandoned and allowed to fill with water. A few years ago the water was pumped out and the quarry put in production again.

Quarry of the Batesville White Lime Co., with the plant of the Independence Marble Co. in the rear

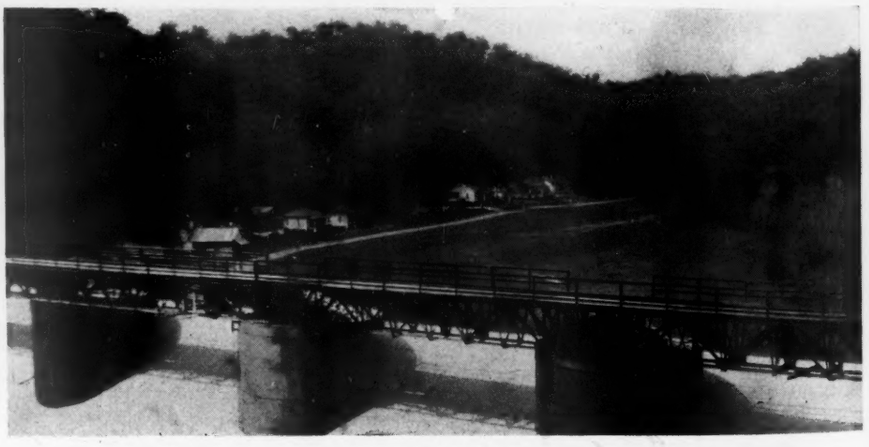
This quarry has the advantage over others in that vicinity of being the most southerly operation along the river, and the bulk of the stone for revetment work south of this point comes from Mr. Hely's quarry.

The rock at this quarry is loaded by hand into special designed wagons holding 3 cu. yd. The height of the wagon box top is only 44 in. so that the labor required to load is not as great as it would be in the ordinary wagon. The wagons are assembled in the quarry by mules and hauled to the river edge in trains of four by means of a 5-ton Packard motor truck. Here the lifting line of the stiff-leg derrick is attached to the wagon bed by means of a suitable sling, and the load swung over the barge and dumped. This stiff-leg derrick has a capacity of 15 tons. Practically all the labor used for this work is negro, and is on a contract or piece-work basis.

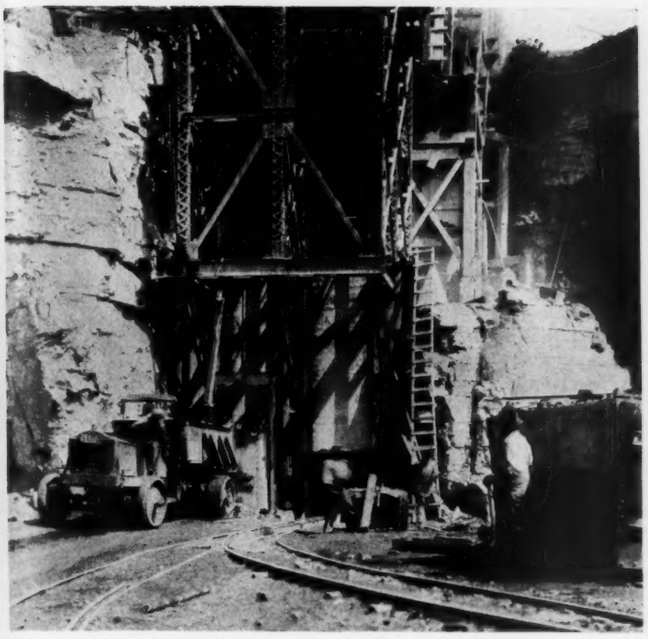
Mr. Hely was very optimistic about the possibilities of further development of the river traffic, remarking about the increase that has been evident the past few years. Not only is he shipping some crushed stone by water, but the Cape Girardeau plant of the Marquette Cement Manufacturing Co., which adjoins his property to the south has recently installed a small dock for loading river barges with cement. Several saw mills close by also have built docks and are making regular water shipments.

The Lime Industry About Ste. Genevieve, Missouri

In the lime producing area of Ste. Genevieve, the first plant visited was that of the Peerless White Lime Co., a subsidiary of the Hunkins-Willis Lime and Cement Co., of St. Louis. This company's interesting mine operation was described quite thoroughly in the May 12



Tops of the kilns at the Batesville plant, the company houses in the background



Truck dumping quarry stone to the skip at the Edward Hely Stone Co. operation

issue of Rock Products of this year, and there has been no marked difference in the method of mining since then. One small stope or room is being mined as a sort of an experiment. In this work, a room with about a 20- ft. face is selected and a narrow, horizontal cut is being made near the roof, of sufficient height for the men to work. When this upper bench has advanced to a suitable distance the floor will be shot by lifters. It is hoped that with the ground thus relieved it will not be so tight, and that there will be a reduction in the amount of fines or spalls as compared with the system of mining now practiced. This rock is very easy to drill—requiring about 20 minutes to drill a horizontal 20-ft. dry hole.

All but one of the kilns of this company were in operation at the time, and F. O. Withrow, superintendent, was quite proud of the tonnage and general operation of the 75-ft. kiln. This kiln and the Wood gas producer used for firing it were described in the June 11, 1927, issue of Rock Products. The company's hydrated plant using a Kritzer hydrator was running day and night. The plant producing pulverized limestone was also busy, the spalls from the quarry being used for this material, although at the time of my visit they were taking some spalls and fines from the dump storage.

Earl Smith, mine superintendent, and also in charge of the company's laboratory, was very busy with problems connected with the softening of water for use in the boiler plant.

This company has a very up-to-date laboratory for control of the plant operation and for testing of the various products. The limestone from the quarry is carefully analyzed from time to time, the hydrate also being checked to note amount of free lime, water, fineness, etc. Where the hydrate or oxide is for food stuff manufacture the very small arsenic content is also determined in this laboratory. Mr. Smith has an assistant for this routine work and devotes most of his time to the mine and research work.

The Peerless White Lime Co. is the only producer in the district that has a chemical control laboratory at the plant, the other operators sending their work to laboratories located elsewhere.

A few minutes was spent at the plant of the Bluff City Lime and Stone Co. These kilns are just a short distance west of the Peerless plant. All of the kilns and hydrating plant were in operation. The rock is all from an open quarry. Louis J. Howard is superintendent.

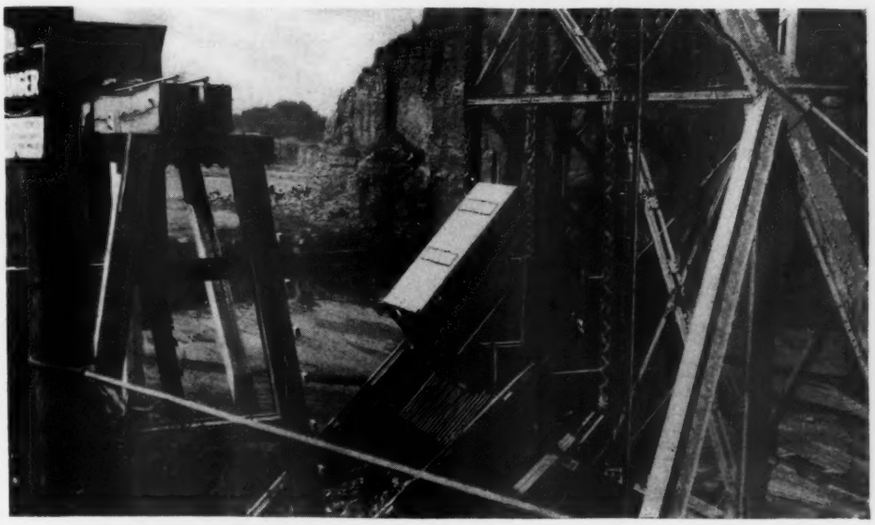
One of the most interesting plants of the district was that of the Ste. Genevieve Lime Co., Eugene Pracht, superintendent Changes are being made from time to time in the method of quarrying, mining and in kiln operation, as fast as possible and still not jeopardize production. Mr. Pracht has promised to write an article for Rock Products describing this plant and the changes that the company is making. Mining operations are conducted by this company as well as quarrying.

The last time plant visited in the district was that of the Western Lime Co. All its five kilns were in production and the hydrating plant as well.

The next lime plant visited was that of the Batesville White Lime Co. at Batesville, Ark. This is a new plant and has some unusual features which will be described in an early issue of Rock Products. Several days were spent at this plant.

The Ozarks

In going from St. Louis, Mo., to Batesville via the Missouri Pacific, the railroad passes through for the most part the eastern edge of the Ozarks. For miles the rails pass through a fertile but very sparsely inhabited and practically uncultivated section for the most part. What houses were in evidence were rude huts. The highways, if they may be called that, were dirt roads in most cases and poor ones at that. The writer was impressed by the great need of highway construction through that section to bring this territory closer to the industrial communities that surround the district. In this connection, one feature of interest at Batesville is the construction of the new steel and reinforced-concrete bridge across the White river. At the point selected the bridge approaches are supported by concrete piles for roughly a mile on each side of the bridge. This approach is necessary on account of floods that are a regular spring occurrence. The bridge, when completed, will be the only all-weather crossing of the White river, and will be connected with state highways topped with crushed stone that later will be concreted, and will connect Batesville with Little Rock to the south and with northern points as well.



Skip hoist of unusual design dumping 14 tons of rock at one load at the Edward Hely Stone Co. plant, Cape Girardeau

With hydro-electric projects that are under development in the Ozarks, making several large lakes and with good highways for tourists to easily reach these new lakes, many resorts will undoubtedly spring into existence and with just a little national advertising this section of the

Two tripod drills starting sinking for a lower level at the Edward Hely quarry

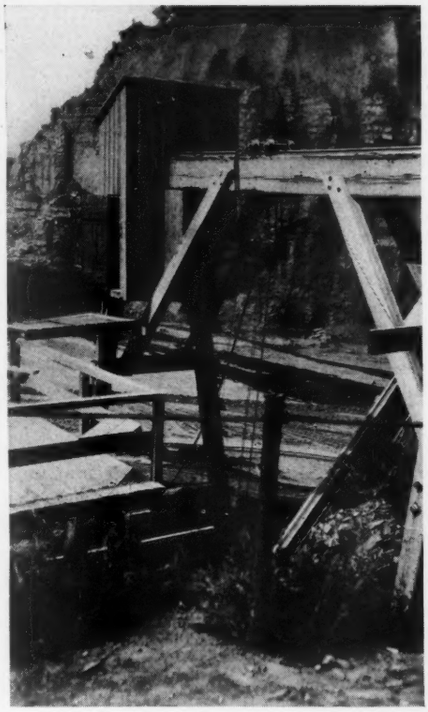
country should receive a far larger share of attention from tourists then it now receives. The Ozarks have been looked upon by most people as a backward more or less unproductive region, which is the case in some parts. The scenic possibilities are not even considered. I think that it is one of the most beautiful regions that I have had the pleasure of visiting, but before it can compete with other scenic places, paved roads and highways will have to be built to make the section accessible by auto.

The Crushed-Stone Industry of the River Towns

Going back to the operations of the Edward Hely Stone Co.'s other quarry, which was referred to in connection with the Mississippi River work; this company is owned entirely by Norman L. Hely, who directs the operation of the two quarries and plant and acts as sales manager, engineer, traffic manager and what not; and with barges to load, a large local truck business to look after as well as car shipments, Mr. Hely is one of the busiest men in the crushed stone business. I felt that I was imposing myself on him by taking considerable of his time showing me all the operations of his company.

The Edward Hely Stone Company was started in 1882 by Edward Hely, father of the present owner. Edward Hely died in 1920 and since that time Norman L. Hely has been in active charge of the operations and sales. The plant was originally built in 1902 as a temporary plant to supply the local railroads with ballast, and it was the intention to abandon the works as soon as the contracts has been filled, but the gradual increase of the use of various limestone products about that time was such that the company stuck and now boasts of a production of 1500 tons per day and represents an investment of $400,000.

The quarry operations are all confined to an open pit, no stripping being done nor is any lateral expansion of the quarry contemplated. The average thickness of the overburden is not great, but there are open fissures filled with sticky clay that make stripping an expensive operation. Since core drilling has revealed a depth of 200 ft. of good rock under the present floor of the quarry the operations in the future will be confined to sinking to an ultimate depth of 200 to 250 ft. and hoisting the rock in a vertical skip. There is



Electric hoist for handling crusher parts or large rocks at the primary crusher of the Hely plant

about 35 years' supply of rock available under this plan.

The quarry sets back from the Mississippi river about 350 yd. The bottom of the present quarry is below the river level, but owing to the dense nature of the deposit there is very little infiltration of water from that source, although in deepening the pit, it is possible that more water will be encountered.

At present the rock is being taken from two benches. The lower bench being about 30 ft. high and the second bench 45 ft. high. The rock shot down from this 45 ft. ledge rests on the main floor of the quarry. On the floor of the other bench two tripod drills were operating, drilling vertical holes for the start of a third bench.

Early Use of Motor Trucks for Quarry Hauling

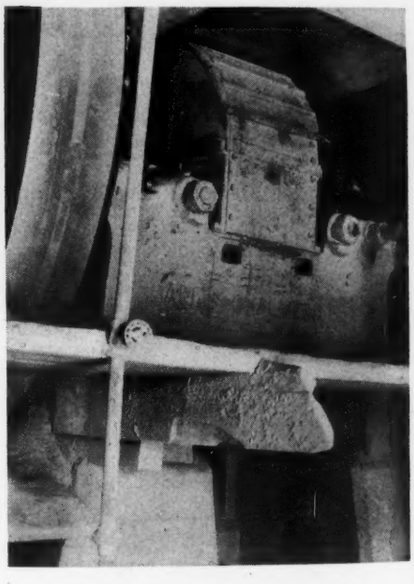
Owing to the small area of the quarry for a production of this size, Mr. Hely abandoned the industrial track haulage system about four years ago in favor of truck haulage. At that time he purchased four Packard 5-ton dump trucks equipped with hard rubber tires. These four trucks have been in use ever since and are still doing excellent work. The trucks are rated at 5-ton capacity but actually the average load hauled is about 6½ tons per trip.

The main floor of the quarry is very smooth, advantage being taken of natural bedding planes and care being taken not to shoot into this floor.

The haulage system is extremely simple, the truck being loaded makes the trip to the base of the head frame or tipple where it backs up and discharges its load into one of the 14-ton skips. The distance being very short it only takes about two minutes to make the round trip.

When asked how this haulage compared with industrial tracks and car haulage as regards costs, Mr. Hely said that he did not have any data to make a comparison but that the cost of truck haulage compared very favorably with the published cost reports of other quarry operations using industrial railways.

One great advantage of this system of haulage is that loading can be resumed ten minutes after a big shot has been



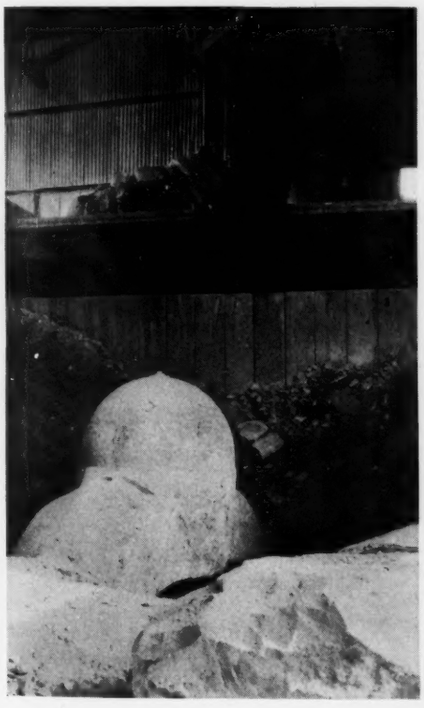
Set of 40-in. rolls for final grinding at the Edward Hely plant

fired, no tracks to move, rebuild or clean off, and no loss in production due to a de-railed car holding up the passage of the rock train.

The tipple and skips used for hoisting the rock to the initial crusher are a very interesting bit of construction. The rock

The quarry of the Columbia Quarry Co. at Krause, Ill., showing the third level at the left and the start of an incline in the foreground to level used by the trucks

from the quarry was formerly hoisted up an incline but with deepening, this method had to be abandoned, and a steel, headframe of very substantial design was installed about three years ago. The headframe, vertical sections and the novel



Car dumping to the primary crusher at the Krause plant

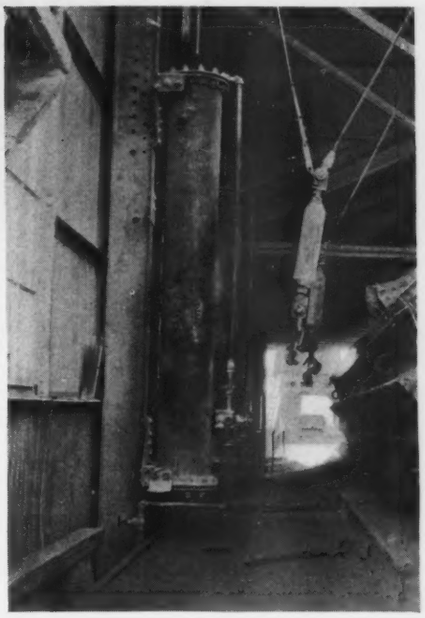
method of automatically dumping the skip are all after the design of Norman Hely, and he can justly be proud of it. The erection was done by the company, the steel fabricated by Strupp Bros. Steel and Iron Co., of St. Louis, Mo.

The vertical section or shaft section does not rest on the bottom of the present quarry floor but is supported by steel cross members and reinforcements securely anchored in the wall of the quarry. As depth is gained it will not be necessary to add any construction members to support the headframe it only being necessary to lengthen the guides for the skip.

Most of the company's business is in one, two and sometimes three car-lot orders, no large shipments being made to any one party. There is a large number of small trucks hauling stone to Cape Girarude for street paving and construction work, which at this time, owing to considerable building is quite an item.

Most of the drilling in the quarry is done by Sullivan tripod "Type J. R." drills although a Sanderson-Cyclone well drill is available. The loading on the first ledge is done with a 1¼-yd. Marion and on the lower level 1¼-yd. Thew, both steam powered.

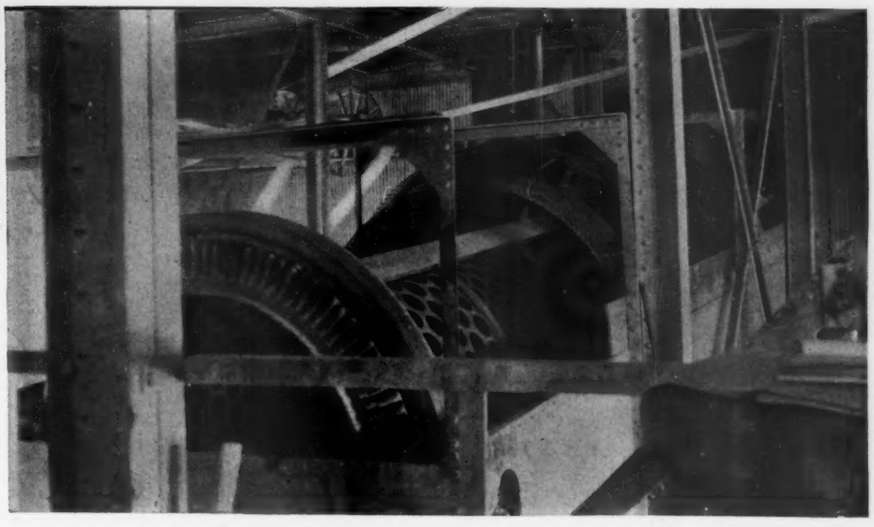
The tipple discharges the skips directly into the No. 12 Allis-Chalmers gyratory crusher, which discharges to a 42-in. Allis-Chalmers elevator, which in turn feeds a 48-in. by 18-ft. revolving scalping screen. Oversize discharges to a No. 8 Allis-Chalmers gyratory, from which the rock is elevated to a 40-in. by 16-ft. secondary rotating screen. Oversize from this screen spouted to a No. 6 Allis-Chalmers gyratory which discharges to a bucket elevator feeding a 40-in. by 14-ft.



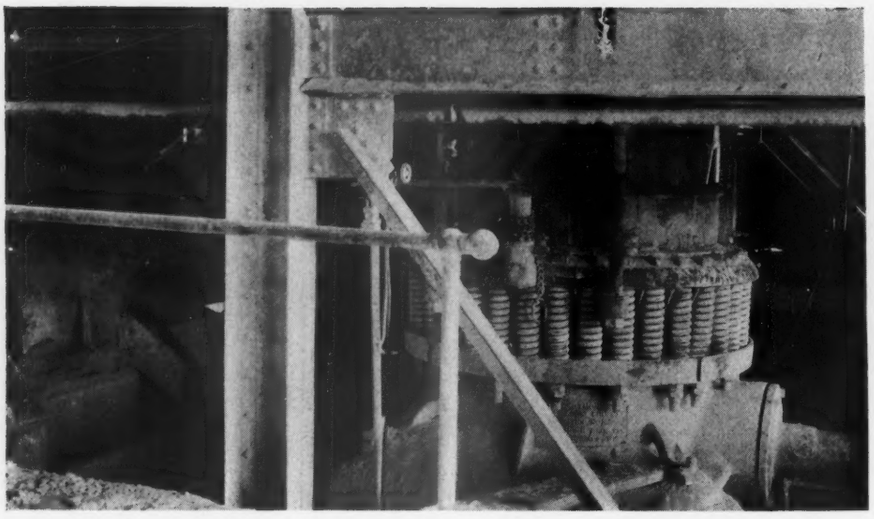
Air hoists for dumping cars at the Krause plant of the Columbia company

revolving screen, and the oversize from this operation is spouted to a set of 40-in. Anaconda rolls. The discharge from the rolls joins the rock stream from the No. 6 crusher.

The scalper removes 2¼ in. to ¼ in. and minus ¼ in., second screen ¼ in., 1½ in to ¼ in. and 2¼ in. to 1½ in. and the



The scalping screen at the Krause plant of the Columbia Quarries Co. equipped with two dust jackets



Cone crushers at the Columbia Quarry Co. plant at Krause, Ill.

third screen removes, ¼ in., ⅜ in. to ¼ in. and 1¼ in. to ⅜ in.

A conveyor runs under all of the bins so it is possible to take any sized rock to a Jeffrey swing-hammer mill for making agricultural limestone.

Promoting "Agstone" With Movies

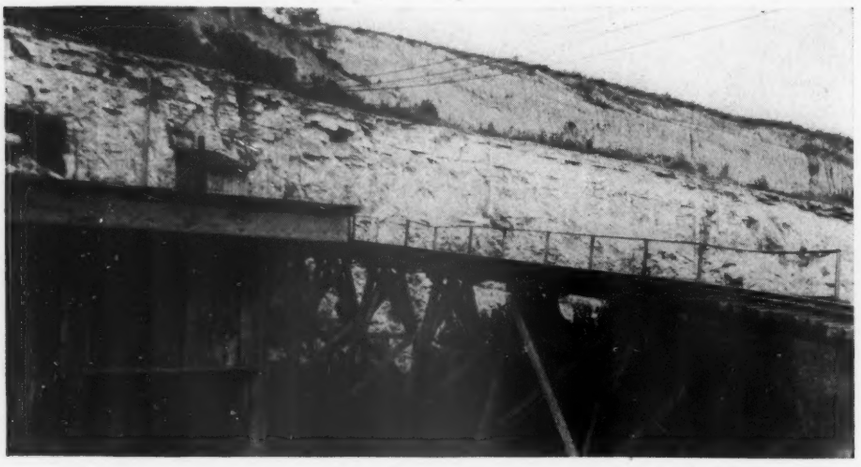
Mr. Hely has taken moving pictures of his quarry and plant operations showing how he produces agricultural limestone. In addition he has interesting pictures showing the methods of application and the field after the crops are matured, proving the advantages of using limestone on the soil. These pictures are loaned out to the various farm organizations, county fairs, and district school meetings, and have done much to increase his sales of that product. Mr. Hely reports that on cotton-growing land there is a marked improvement in crops on "agstone" treated land.

The rock from both these quarries is a very hard limestone, almost as hard as granite, and owing to this feature the Missouri Amiesite Corp. has built a plant just across the track from the crushed-stone plant. As a result crushed stone from this quarry is shipped to a much wider territory then would otherwise be possible.

All machinery in the plant is driven by electric motors except the compressor, which is driven by a Sullivan Corliss valve engine. The compressor capacity is 1300 cu. ft. of air per minute. A total of 550 hp. is required to run the plant.

One feature of interest at this plant is that the main arterial highway connecting St. Louis and Memphis passes directly through the plant. The Frisco railway lines do likewise. The quarry operations extend up to the edge of the right-of-way of this highway and for this reason extreme care must be taken in blasting. As one approaches from either direction along this highway there are large signs warning the traffic not to pass beyond that point on hearing the whistle. A few minutes before shooting long continued series of toots are given on these whistles which continue until the first shot is fired which may be two minutes or longer.

Broken limestone in one of the stopes of the Columbia Quarry Co. mine at Valmeyer, Ill.



Trestle connecting the mine at Valmeyer with the plant, showing the old quarry face in the background. Note the tunnel entrance at the left

Columbia Quarry, Columbia, Ill.

A stop was made at the plant of the Columbia Quarry Co., at Krause, Ill., a few miles north of Columbia, Ill. This plant was built in 1925 and replaced one that was destroyed by fire the same year. The plant is of all steel and concrete construction, fireproof throughout. The plant is very well designed and constructed. It was described in detail in Rock Products, August 8, 1925.

A few changes have been made in the method of operating. One of the changes is in the quarry, which was formerly operated from two benches. The old upper bench was found too high for safe steam-shovel operation, so it has been divided into two levels the upper level still being higher than the second level and is the

Loading in the quarry of the Casper Stolle company at Stolle, Ill.

main source of stone. The bottom ledge is used as a source of stone only during a great emergency and remains as before with no changes in method of quarrying. A new incline is being run from the main haulage level down to the new level and will be so laid out that standard-gage cars can be

Quarry of plant No. 1 of the Casper Stolle company at Stolle, Ill.

run directly to the muck pile and loaded. With this arrangement the railroads can be quickly supplied with material for fill for repair work. This product is just the run-of-quarry rock and no crushing or sizing being necessary. This stone can also be taken to crusher and does not interfere with regular flow of rock from upper ledge in transportation.

The company has recently purchased a Nordberg narrow-gage track shifter for use in the stripping operations, the track being shifted both at point of loading and on the dump by the machine.

The rotary dumper for unloading the cars at the initial crusher has been done away with entirely. The cars are now dumped by means of Curtis air hoists. By making slight alterations in the type of car that was used it was possible to make the change without purchasing new equipment. The advantage of dumping with air is simplicity and quickness of the operation. Two cars can be dumped at the same time.

The No. 8 Allis-Chalmers "Type K" secondary crusher has been removed and a No. 4½ Symons "Cone" crusher substituted. This crusher is driven by a 100-hp. motor, and takes the 7 to 2-in. stone from the primary crusher and reduces it to 1½-in. size. With this change the same tonnage is secured with one less reduction. Therefore there is a duplicate unit at all times.

In the storage yard new truck bins have been built to expedite truck shipments and C. E. Klaus, superintendent, advises that there has been a very noticeable increase in motor-truck shipments from the plant. This stone all goes for local highway construction.

The next plant visited was the Valmeyer operation of the Columbia Quarry Co. This proved to be a very interesting operation, especially the mine, of which a de-

Crushing plant of the Casper Stolle company at Stolle, Ill.

tailed description will appear in an early issue.

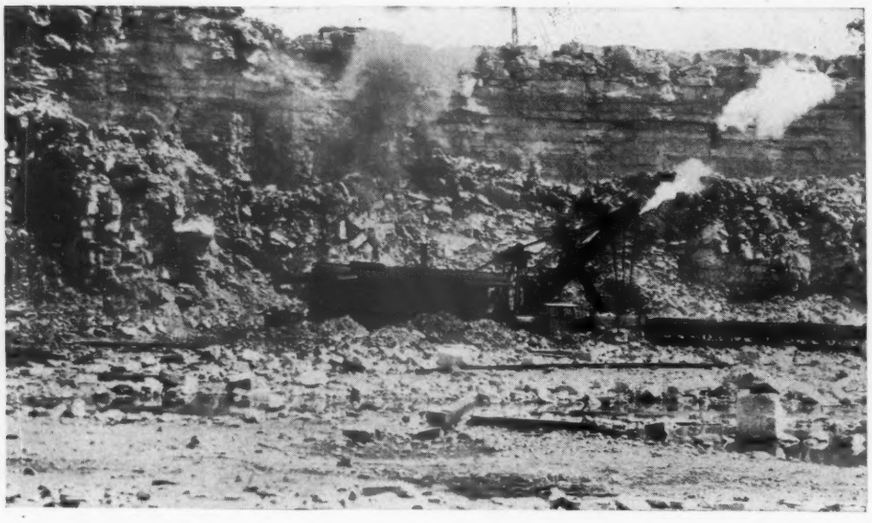
The Casper Stolle Quarry and Contracting Co.

This company is one of the oldest stone producers in the St. Louis territory and operates three plants. No. 1 and No. 2 plants are at Stolle, Ill., and the other is at Falling Springs. These three plants are all within a mile of each other. The first two crushing plants get stone from the same quarry. The holdings of the Illinois Electric Limestone Co. (about

Office and boarding house of the Casper Stolle Quarry and Contracting Co. with the 8-K plant at the left in the distance

which more will be written later) separate these two properties of the Stolle company.

The Illinois Electric Limestone Co. recently took over the quarry formerly operated by the East St. Louis Stone Co. at Falling Springs, Ill. The new company dismantled the old plant and built a modern crushing and screening plant of large capacity that has many unusual features. This company's operation is perhaps one of the most modern in the mid-Mississippi river region. A detailed description of this plant



The large shovel at work in the quarry of the Illinois Electric Limestone Co., Falling Springs, Ill.

will appear in an early issue of Rock Products.

Casper Stolle, father of the present president of the company, started in the stone business in 1846 in St. Louis, Mo., and in 1882 the company installed a No. 3 Gates crusher at Stolle, Ill., for supplying ballast for railroads. Since then the plant has been rebuilt thirteen times, these changes being necessary to keep up with more modern methods of production and to make the higher grade products that later years demanded. It is interesting to note that the crusher above referred to is still in service at their Falling Springs plant.

Thirty-six years ago the company was incorporated as the Casper Stolle Quarry and Contracting Co., and F. W. Stolle, son of the founder, has been in active charge of operations since that time. The company do no contracting at the present time. Casper Stolle died 22 years ago.

The No. 1 quarry at Stolle, Ill., is an open-pit operation and supplies rock for two crushing plants, which have a combined output of 1300 tons per day. The quarry has been worked to a depth of 100 ft., which makes the floor of the pit about 60 ft. below the floor line of the crushing plants. Rock is loaded by a No. 50 Bucyrus electric caterpillar equipped shovel, with a 2-yd. bucket and a "Type B" Erie, into specially designed, end-dump cars holding 3 yd. each.

In loading the cars any large rocks are put on the top of the load, and in the event that they are too large for the crusher they are mud-capped and blasted on the cars. Mr. Stolle has found this to be satisfactory, although it is somewhat hard on the equipment. After shooting the stone, the cars are hoisted up an incline to the crusher by an Allis-Chalmers friction hoist.

Considerable tonnage of rip rap is shipped from these plants for railroad fill and washout purposes, and when these orders are received, and they are always rush orders, the rock is hoisted up this same incline but can be dumped direct to the cars by moving the automatic dumping equipment from the crusher to this loading apron.

The two plants are known as Nos. 8-D and 8-K, which indicates the size of the Allis-Chalmers crushers at each plant. At the former, the rock after crushing is elevated and fed to two rotary screens. The finished products from these screens fall to bins below. The oversize is returned to a No. 5-D Allis-Chalmers crusher. The discharge from this crusher is conveyed back to the bucket elevator, which receives the discharge from the initial crusher. The fines from ⅞ in. and down are passed over "Hum-mer" vibrating screens, where the ⅜-in. sizes and "agstone" are removed and fall to their respective bins. The entire plant is driven by a 250-hp. General Electric motor from a line shaft.

There is also an American pulverizer and a Gruendler hammer mill at this plant, these being driven by a 100-hp. G. E. and a 50-hp. Allis-Chalmers motor, respectively.

The No. 8-K plant has about the same flow of material, except that the fines are separated through a Universal vibrating screen. It requires 200 hp. to drive this plant. Power is supplied by two Westinghouse and one General Electric motors.

The No. 2 quarry at Falling Springs was opened three years ago. This plant was built to take care of the increased business and was located at Falling Springs on account of a more favorable freight rate than is secured from Stolle, the station of the other two plants. Falling Springs is on the rails of the Terminal Railroad of St. Louis.

The company owns 300 acres of land. The rock is taken from the face of a bluff, which rises from 100 to 225 ft. above the St. Louis Terminal Railroad Co. tracks. No stripping is necessary, as the quarry had been operated by the old Vandalia Railroad and they did what stripping was necessary or will be necessary for many years.

The rock is loaded by a Erie "B" caterpillar shovel and hauled to a No. 7½ Allis-Chalmers crusher by a 3-ton Whitcomb gasoline locomotive. After crushing, the material is elevated to two Niagara vibrating screens. The oversize passes back to a No. 3 Gates crusher (first used in 1882), which is augmented by a Williams hammer mill. The entire production can be pulverized if demand warrants it.

All of the equipment at the Fallings Springs plant is driven by Fairbanks-Morse, type H.V ball-bearing motors, there being nine motors totaling 380-h.p., as follows:

	H.P.
Williams hammer mill	200
Primary gyratory	75
Air compressor	40
Screens	25
Secondary crusher	15
Bucket elevator	10
Portable dust conveyor	5
Centrifugal pump	5
Permanent dust conveyor	5
	380

Storage Handling

The company has a storage pile at Stolle, Ill., of approximately 60,000 tons, which is under a trestle 900 ft. long by 30 ft. high. Crushed rock is hoisted up an incline by a Flory steam hoist to the trestle, where it is dumped by means of a block placed at desired points along the track. Material in the storage pile is reclaimed by an Erie "Type B" revolving steam shovel and truck shipments are loaded from this pile by a Barber-Green loader. Harvey Foster is superintendent of No. 1 plant, and Joe Rayoun is superintendent of Plant No. 2.

A word might be said in passing regarding the company's policy of caring for its employes. For the single men there is a modern stone building equipped with steam heat, bathing facilities, electric lights, etc. The families are provided for with neat and attractive detached houses, each with enough ground for a garden. These houses are rented at a very nominal rent. It is the desire of Mr. Stolle to keep his men contented and he wants them to remain with him; and this is one way that he has brought this about.

Lime Burning Practice Based on European and American Observations

Part IX.—The Hanstaeten Gas-Fired Kilns (Germany)

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

ANOTHER GAS-FIRED LIME plant in Germany having to an extent the same characteristics of the Hoennetal plant of the Rheinisch Westphalischen Kalkwerke, described in the August 4 issue of ROCK PRODUCTS, is the Hanstaeten plant of Joham Schaefer Kalkwerke, Diez. a. d. Lahn, near Coblenz. (Figs. 49, 50, 51, 52.)

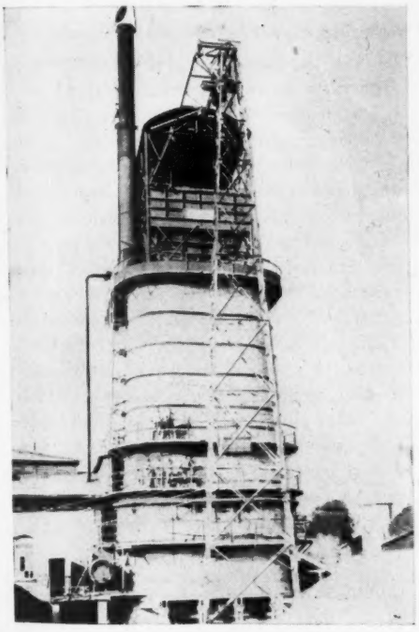


Fig. 49. Kiln of the Hanstaeten plant showing platforms for watching the burning

At this plant the fuel used is lignite, briquets of the German variety, which is a fuel of higher grade than our Texas lignite. This particular lignite is called in Germany, brown coal. It is mined, crushed, dried and pressed into briquets; and by this process improved in quality so as not to be at all comparable to the lignite of our acquaintance. The heat value of the finished product is about 9,000 to 10,000 B.t.u., with about 17% moisture remaining and about 6% to 9% ash. To facilitate producer operation a small amount of coal is also fired.

The output of these kilns is around 50 short tons each, and a fuel consumption of about 30% of the lime drawn, this being equal to a ratio of 3.3 to 1, and an efficiency of around 45%. This efficiency is not as high as that of the previously described plant, but still it is rather good considering the lower grade fuel and certain apparently inherent faults of the plant.

As the construction of the kilns was described to the writer, little air enters through the cooler. It was stated that air passes up into the eyes through zigzag channels in the kiln wall. This method of air preheating is at best very poor. However, some air must be entering through the cooler, since the lime drawn appeared to be cool.

The kiln height from the point where lime was drawn to the gas off-take is 65 ft., the superstructure with the rock storage had an additional height of 30 ft., the total height being around 100 ft. The capacity of each stone storage bin on the top of the two kilns was 85 tons of rock, or sufficient for a little less than one day's run.

A study of Fig. 49 fails to reveal any suitable platforms that would enable workmen to trim the kiln. There also were no suitable openings provided; however, these kilns are not hung. They stick for a while, then slip of their own accord. Several platforms are provided, conveniently located to rows of numerous 4-in. size observation holes, leading into the kiln shaft. Through these, a man continuously on watch has the burning process under observation. His main aim is to maintain reducing conditions. The holes lead downward at an angle (Fig. 52), so gas tends to collect in them. When the plug is withdrawn, if the collected gas is of the smoky type, the conditions in that zone are considered satisfactory.

In this plant waste-kiln gas is also used to temper the kiln temperature; part of it is added in the eyes ahead of the arches, and part may be injected directly into the kiln. The impression gathered was that they had their troubles in keeping the kiln on the line for a long time, according to German standards. For kiln lining different brick were tried, and silica brick were found preferable to any others. One would think that magnesite brick would be about ideal for a lime kiln, but they were tried and lasted only about two months.

Fig. 51 shows the lime-drawing method; lime is raked into monorail carts and these dumped directly into the railroad cars. The kiln is drawn every hour and a half to two hours, and for every two draws, day and night, it is filled once. This frequent drawing should be much better than the longer four-hour periods commonly used in the United States; and especially better than the ridiculously long six- and eight-hour periods still in vogue at some plants. The appearance of the lime drawn was good and there was little core.

Blast for Gas Producers

While in one or two American plants waste-kiln gas is used with the air to blow producers, with entire satisfaction, most plants employ small, inefficient boilers, very wastefully fired. In consequence, the overall fuel efficiency of the entire plant is greatly reduced, and certain other costs are increased. The efficiency of most of these auxiliary boilers is only about 40%, not much more than about 5 lb. of water being evaporated per pound of coal. At the Hanstaeten plant steam was used also in the blast, but the system of its generation was

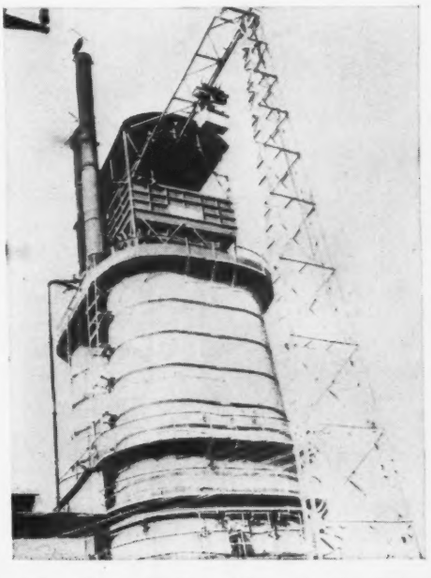


Fig. 50. Another view of the kiln which shows the method of loading

very clever and highly efficient. Instead of a boiler there was a chamber through which air was drawn by the producer blower. In this same chamber there were open water pans heated with gas from the producer. The air circulated freely over the pans and became humidified. The products of combustion from the burning of the gas mixed with the air and were drawn into the producer. By this means, not only the vapor from water evaporation was utilized, but also the CO_2 and the water vapor that formed during combustion of the gas. The efficiency of the chamber, excepting for a small radiation loss, was 100%, because the products of combustion did not escape up a stack, but were usefully employed; as usefully, say, that if the ordinary boiler generates 5 lb. of steam with an efficiency of 50%, then in this case, per pound of coal, 10½ lb. of steam were generated—10 lb. of water evaporated and ½ lb. formed from the combustion of the hydrogen in the fuel. In addition about 2½ lb. of CO_2 were given off, so in all, instead of 5 lb. there were produced 13 lb. of a useful endothermic agent.

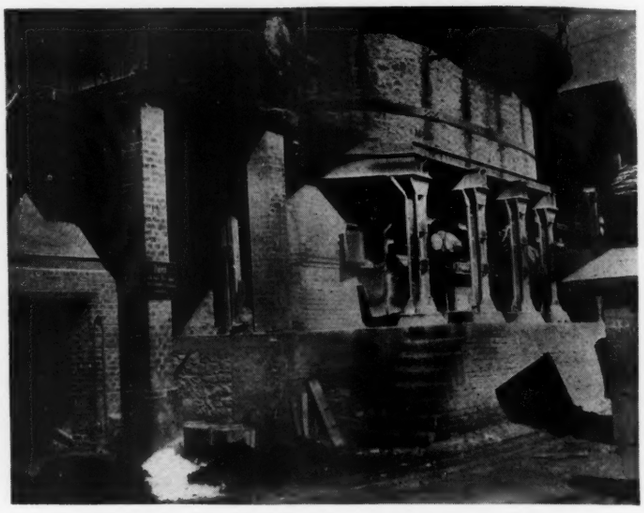


Fig. 51. The drawing is accomplished by raking the lime into monorail cars from the kiln

The control of such an apparatus is very simple; the water in the pans could be maintained level with floats, the amount of cooling element in the air could be regulated by the regulation of the gas flame. Sprays also could be used, and the air heated to any desired temperature while saturated.

This concludes the information obtained about German gas-fired lime kilns; later on, however, as interesting, or probably even more interesting, information will follow about certain gas kilns used in England. It is the intention to take up next what were until recently the popular ring kilns; but before that can be done it is necessary to describe to an extent the quarry system used at the plant of the Rheinisch Westphalischen Kalkwerke and at the Limburg plant of the Joham Schaefer concern.

(To be continued)

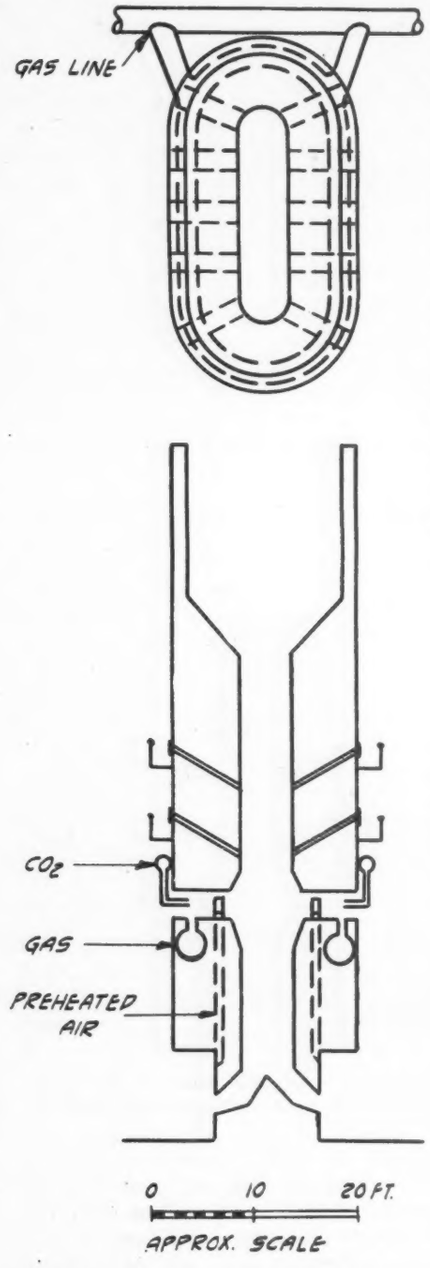


Fig. 52. A cross-section of the Hanstaeten kiln showing the observation holes and gas entrances

Amount of Sand in Washed Gravel Ballast

(From *Railway Engineering and Maintenance*, Chicago)

By H. R. Clarke
General Inspector Permanent Way, Chicago, Burlington and Quincy R. R., Chicago

THE MAXIMUM SIZE of the pebbles permissible in crushed and washed gravel depends on the size and uniformity of the pebbles found in the pit, and the percentage of sand should be such that it will fill the voids between the crushed pebbles. Where the pebbles in the pit run fairly large, the maximum size of the pieces to be left in the ballast may be as large as 2 in., but if they are small, this size should be reduced to insure that there will be a large proportion of pieces with angular edges. The percentage of sand will vary somewhat with the size of the crushed pebbles, and should be sufficient to fill the voids. This latter is of particular importance on tracks carrying traffic such as coal or live stock, where considerable foreign matter is likely to fall from the cars, since, if the voids are filled, the foreign matter is prevented from working down into the ballast, where it impedes the drainage and causes puddled track.

On the Burlington, gravel obtained from a pit with a large proportion of small pebbles was crushed to a maximum size of 2 in. and 20% of sharp torpedo sand was specified. This ballast did not give satisfactory results, and experiments were made with ballast from this pit, using from 0 to 30% of sand, and with different maximum sizes of the crushed pieces. As a result of these experiments, the maximum size of the stone was reduced to 1½ in. and the amount of sand was increased to 30%. The gravel so prepared was found to work more easily than that with the larger stones and less sand, while the track became solid more quickly, and the ballast did not become foul in as short a time, since the filled voids permitted foreign matter to be removed before it had a chance to work down.

By W. H. Penfield
Engineer Maintenance of Way, Chicago, Milwaukee, St. Paul and Pacific R. R., Chicago

OUR CRUSHED AND WASHED GRAVEL ballast is secured from contractors, who also furnish gravel for concrete, and the coarse aggregate is crushed from the stones which are screened out of the concrete gravel. These stones are crushed to a maximum size of 1 in., after which approximately 40% of sharp torpedo sand is added, the percentage varying somewhat with the size of the coarse aggregate in order that all the voids in it may be filled. This is done to prevent cinders, coal dust and other matter from finding their way into the ballast, thereby causing it to become foul and interfering with its drainage. The sand also keeps the rounded pebbles, which are not crushed, from rolling under the ties, and forms a solid bed for the ties. There would be no objection to increasing the maximum size of the coarse aggregate to 1½ in., but it is not desirable to have the maximum larger than that. We have used washed gravel prepared in this manner for four years with good results.

Again, That Matter of Costs

And Their Value to the Operator in Portland Cement Plants

By H. H. Blaise
Everett, Wash.

THAT MATTER OF COSTS, is to every cement plant operator an important phrase. In these days of increasing competition it becomes more important every hour. Not that competition and costs have not always been important factors in this industry, but it does seem that in the last few years the magnitude of the question has increased by leaps and bounds.

It is very likely that the mills of this country will this year sell between 160 and 170 million barrels of portland cement. These figures in themselves are magnificent and reassuring to a vast degree. At least they provide a certain confidence and assurance to the hard-pressed manufacturer, that a balance sheet inclined towards gaudy colors does not. That time is easily within the memory of most of us when the market absorbed one-half this amount at a considerably better margin of profit amid the plaudits and self congratulation of a hundred different sales departments. Since then this figure has increased until in the last two or three years there has been sufficient evidence to indicate that a saturation point has been reached. Annual increases in sales have dwindled from 10 and 20% to a mere 2 or 3% and many individual plants have been hard put to hold their own.

Cement Industry Growing Enormously

While this has been going on there has been a tremendous volume of construction and reconstruction in the industry. Scarcely a week goes by in which we do not read of one or two or three new mills being projected. Of course many of these mills have never materialized, but there has been sufficient new construction and increase in plant sizes to bring about an enormous surplus of plant capacity. It is difficult to state with any degree of accuracy just what this amount of over-capacity is. This is because we are necessarily reliant upon the estimates of the owners and plant officials of each plant, and in such cases the capacity figures are as flexible as the weights of fish that we caught last fall. It is safe to say that the mills of this country have a potential capacity of 230,000,000 bbl. per year.

A considerable part of this exists in mills that can not now manufacture at a profit. They are simply idle during this period of overproduction. It would be difficult to imagine just what the situation would be if federal-aid or state-aid road programs were withdrawn. Happily it would seem that road building will continue at its present rate for a great many years yet to come.

Nearly every portion of the country has witnessed continual reductions in the price of cement. This, in spite of the fact that portland cement was one of the very few commodities that passed through the war period without any appreciable price increase. True, cement now costs the public somewhat more than it did in prewar days, but in the main this situation can be readily charged to the inability of the railways to haul this tonnage a figure anywhere near approaching the prewar freight rates.

With very few exceptions, there have been, in the last few years, plants in every district that were on the verge of bankruptcy. Obsolescence, lack of organization, lack of working capital, failure to increase sales pressure and many other things have contributed to this condition. Practically without exception these plants have thrown caution to the winds when they have approached a precarious situation and have dumped cement on the market at any figure it could be sold for in a last desperate effort to gather in as much money as possible, and thus minimize the inevitable loss. For this there can be no criticism for a drowning sailor may certainly be accorded the privilege of grasping at a straw.

Regardless of the praiseworthiness of such tactics the situation has existed, and it will fall upon the survivors to carry on at ruinous prices. It is a situation that shows every sign of being permanent, because while our national and state governments definitely eliminate competition in certain fields, such as the production of power, and among the public carriers, they demand that excessive competition exist in other industries, among which the portland cement industry may be numbered. How this policy can be reconciled to the most common instincts of fair play or to ordinary business principles, is beyond our ken, because it is perfectly evident that it is the same public that bears the brunt of the cost in both cases. However, it is not the purpose here to discuss that situation, but rather is it the intention to bring out the fact that such a situation does exist and must be met by the consistent and continual practice of economy.

The Budget System

To this end I will discuss certain ways and means of bringing about these same economies in the operating ends of our plants. A great many organizations have in practice excellent systems of accounting. They know to the "jitney" what it costs to produce their raw materials, their clinker, their power and every step until the cement is on board the cars, and the bills are collected. Beyond a doubt a careful survey of a number of these methods would reveal a fairly standard method of attack. You will hear as you visit the offices of the various plants arguments for or against the plan in detail.

For example the good old word "budget" has withstood a flood of oratory for years. One man will laugh outright at the thought of a budget. Another will extol its virtues to the skies. But we can, without fear of contradiction, make the statement that there never was an organization that existed without a budget. The plan is older than the word, and its use depends to a great extent upon its definition. For example no manufacturer would sensibly go into the market without at least a dim idea of the price he must get for his product. He knows that his cement costs him say $2.00 per barrel. He further knows that if he sells it for $1.99 per barrel he will eventually go bankrupt, as certainly as he knows that he is alive.

There is the outline of the budget. No matter whether it is a mental computation or an elaborate outline of procedure worked out by experts, it exists as a plan to be met and followed to the best of ability. As to the amount of detail which must enter into the scheme in order to make it successful to the utmost, there is much controversy, but as to the plan as a whole there can be no negative opinion. In other words, there must be a plan of action, amenable to change of course, but *plan there must be.* If we must err in the matter, let us err on the side of detail. Let there be an excess of planning rather than not enough. Planning and execution are not synonymous terms.

Now then, to what extent should information be revealed to the operating division? Should the plant superintendent be trusted to the extent of contact with his actual cost figures? Should he be trusted to the extent of being told the actual conditions under which his organization can prosper? Should he be trusted to the extent of having information that will not only tell *when* he is not making money for his company, but *where* he is not? And if he should be so trusted is it not possible that plant costs in their total might be entirely satisfactory, but in certain details exhorbitant? Is there one better qualified to stamp out such objectionable

items than the man on the firing line, the man that uses the fuel, the power, regulates the production, hires the men, repairs the machinery, uses the oil waste and grease, fire brick, power and the one hundred and one items that go to make an operating cement plant?

Attitude of the Management

It is evident that there are a large number of cases where the management has answered, "No, our plant officials do not need this information, it costs money to compile these figures, our plant superintendent is a practical man, not an accountant; such methods are for big organizations; we have never done this; our plant superintendent might talk to our competitors; etc."

One man who was questioned upon this subject ridiculed the whole idea. He said, "to run my whole organization, which produces 2000 bbl. a day, I have but one bookkeeper. This man takes care of orders in his spare time. We keep but one set of books. On one side of the page we post the amounts of money that we pay out. On the other side we record the amount of money that we take in. The difference between the two totals should equal our bank account, and as long as this bank account increases we know that we are making money."

Personally I wonder whether it would not have been far better for this man to also discharge his bookkeeper and run his business from his bank-book alone. This gentleman, in further proving his statement confessed that he had been through the mill office of one of the altruistic, efficient organizations. He said that he had counted fourteen bookkeepers there digging up worthless details, details that were records of things past, post-mortems so to speak.

"There," he said, "is an example of your wonderful efficiency." Of course, such an example is as far from the point as his case deviates from the general system. In both cases the failure lay not in the system but in the minds of the men behind it. Moderation should be practiced in any business. This can only be done with moderate minds behind it.

The only successful exception that I can recall to this rule was in the case of an old operator who had picked up a plant that consisted of nothing more nor less than junk. It was during a period of heavy demand for cement. He patched his plant up here, picked up more junk there, at a bargain, bought for a song some old power equipment that had been declared out of date twenty years before, pieced together the best of two or three old kilns to make one good one. After he had done he had an investment of not over $450,000; and he sat down to make cement without overhead.

I think that he really came as near to accomplishing this as anyone ever did. He had no sales force. He belonged to no association and therefore paid no dues. His men disliked him heartily, but worked for him for less money than they could readily have obtained elsewhere. To furnish a fitting climax he finally succumbed to arguments that he should accept a profit of 400% upon his investment and retire. I believe that investigation will show that this is the original man to fall in the water and emerge dry.

Keeping and Using Production Costs

Most plants use a general system of charge accounts, similar to that developed by the Portland Cement Association. Roughly each department has a key number which is subdivided into the four main items: Operating labor; Repair labor; Operating supplies, and Repair supplies. Other items peculiar to the department, or upon which it is wished to pay especial attention, are given numbers in this same department. In addition to this each department head turns in a daily operating report card upon which is listed the actual operating time and the stoppage causes. From these two reports, one based upon the time distribution and the man hours of the department, and the other upon the machine efficiency, can be based a system for portraying clearly every day the actual cost of each department, and a breakdown of the charges within it.

Under such a method it is an easy matter for the operating head to place his finger at once upon the reason for an unusual cost in any department. Without it, high costs may not be discovered for some time, or not at

OPERATING REPORT — PLANT Nº 3 — APRIL 8TH 1928

	O.L.$	R.L.$	O.S.$	R.S.$	MISC.	TOTAL	PRODUCTION TO-DAY	PRODUCTION TO-DATE MO.	UNIT COST TO-DAY	UNIT COST THIS MO.	MONTH BUDGET	O/O OVER BUDGET	HOURS OPERATED	CAUSE LOST TIME	COST EXPLANATION
QUARRY	60	15	10	2	412	599	1286 TONS	9000 TONS	46.6¢	28¢	25¢	+12	6.35	1-HR. CHOKED CRUSH.	$412 EXPLOSIVES
SHALE	16	—	—	—	—	16	300 TONS	2400 TONS	5.3¢	14¢	14¢		8.00	NO TIME LOST	
CRUSHING	16	5	8	10	—	39	1286 TONS	9000 TONS	3.0¢	5¢	6¢	-16.6	6.00	.35 FOR ROCK .65 FOR CARS 1.00 CHOKED CRUSH.	
RAW MILL	32	12	36	—	—	80	3200 BBLS.	24000 BBLS.	2.5¢	6¢	5¢	+16.6	23.00	1-HR. POWER	$36 GRINDING MEDIA #2 MILL
KILN	60		2			62	2800 BBLS.	23600 BBLS.	2.2¢	5¢	4¢	+25.0	22.80	1.2 REMOVE FIRE RING #3&4 KILNS	
KILN FUEL	12	4	2	5	750	773	200 TONS	1600 TONS	38.4	28.¢	24¢	+16.7	24.00		
CEMENT	40	6	3	46		95	3160 BBLS.	25000 BBLS.	3.¢	6.¢	6.¢		23.00	1 HR. POWER & REPAIR FEEDER	$ REPLACE BUCKETS #2 ELEVATOR
POWER	10		2	1	420	433	42,000 K.W.H.	320000 K.W.H.	.99¢	1.¢	1.¢			PWR. OFF OVERLOAD 10 A.M TO 11 A.M.	
DIRECT COST	246	42	63	64	1582	2097	3160 BBLS.	25000 BBLS.	66.3¢	67.1¢	60.6¢				
MILL OVERHD. YARDS	36		18	102		156	3160	25000	2.9¢	2.5¢	25¢		8.00		$102 NEW RAILS ON YARD TRKS.
MILL OVERHD. LAB.	30					30	3160	25000	.99¢	1.2¢	1.1¢	+9.	24.00		
MILL OVERHD. STORES ETC.	26					26	3160	25000	.82¢	1.0¢	1.0¢		24.00		
BIN COST	338	42	81	166	1582	2309	3160	25000	73.¢	70.3¢	64.9¢	+8.5			
SACKS	86	4	6	6		102	50000	350,000	2.¢	3.6¢	4.0¢	-10	8.00		862 M SACKS ON HAND AT 6 A.M.
PACKING	100		12			112	4000	30000	2.8¢	3.0¢	3.0¢		8.00		

MAN HRS. IN MILL TO-DAY	MAN HRS. PER BBL. TO-DAY	TOTAL MAN HR. MO. TO DATE	MAN HOURS PREVIOUS MO.		KILN 1	KILN 2	KILN 3	KILN 4	KILN 5	TOT. BURNED	TOT. FOR MO.
1050	.31	9010	31000	BBLS. MADE	500	510	400	480	900	2800	23600
				HEAT/BBL. B.T.U'S.	1462 M	1380 M	1850 M	1760 M	1300 M	1496 M	1345 M
SACK & PACK MAN HRS. TO-DAY	SACK & PACK MAN HRS./ BBL.	TOT. SACK & PACK HRS. FOR MO.	TOTAL SACK & PACK MAN HRS. LAST MO.	CEMENT STOCK	CLINKER STOCK	SLURRY STOCK	CLAY STOCK	ROCK STOCK	FUEL STOCK		
372	.09	2400	8640	86000	45000	8630	300 T.	6780 T.	2460 T.		

Sample cost analysis sheet for a five-kiln cement plant

all perhaps in numerous instances.

It is customary in all plants to make a daily operating report. This report is generally made in duplicate, one for the general office and the other for the plant. This report is, as a rule, made in the merest skeleton of form. It gives the daily output figures by departments and possibly the estimated inventories. It is, of course, vitally necessary that these figures be kept. But to assemble the costs in a way that will enable intelligent interpretation for the purposes of cost control to be made, would involve the expenditure of more time than could normally be delegated to the job.

A Complete Report Necessary

A simple method of doing this, and taking but an hour and a half of a good man's time would be to make the total cost spread to the nearest dollar on this daily operating report. At first it would appear to be rather complicated, but in reality it is the assemblage of figures already existent, but buried in the timekeeper's distribution sheets, the stores requisitions and elsewhere. Only by exposure to light may costs be controlled. Otherwise they too often do the controlling themselves. The sooner they are brought forward, the more efficient the correction.

It is not soon enough to assemble them in a monthly report. That may always be done for the sake of accuracy to the penny, but in order to really use these figures, which should be compiled for no other purpose, it is necessary to bring them out quickly and frequently.

The plant official in charge of operation should be competent and trustworthy enough to have this information. If he is not then he is not suitable to occupy the position. That information should include, first of all, the production figures. He is interested first in "how much." Next he is interested in the efficiency rate of production, or "how well." It is not meant to refer to quality by "how well" for quality production is a foregone conclusion in any well regulated plant.

In the accompanying tabulation is given a rough idea of how a form should look, that would assemble these important data. From left to right we have the headings: Operating labor; Repair labor; Operating supplies, and Repair supplies. To the right of this is a Miscellaneous column. Under these five headings is given to the nearest dollar the amounts spent that day in each department. In the next column to the right the department expenditure is totaled.

A comparison with the production rate to date is obtained by the inclusion in the next two columns of the day's production and the month's production. The unit cost for the day is obtained by dividing the production into the total departmental cost for the day, and this too is compared with the monthly unit cost in the next column, and the budget rate in the next. Experience will in a short time enable a budget figure to be made that will fall very close to the actual figure under correct conditions.

A quick check of the "Hours operated" column, next, will advise us whether the department has operated full time or not, and why. This is very important in checking up failure in machine efficiencies. Under "Explanations," we find information concerning the larger charges of the day. Across from "Quarry" we find a charge of $412, which is explained as being an explosive charge. If a large shot has been fired in the quarry; there is no need for further investigation. A charge of $36 extra in the raw mill, a large charge of $750 in the kiln department, etc., are all shown to be part of the day's routine. It is plainly evident that a repetition of a single large charge might well point out conditions that should be remedied. For example, if it were necessary to replace flights on a given screw conveyor frequently, the charge would show up here. Investigation might show it to be cheaper to handle the material with a larger screw or a different type of conveyor.

Below are given "Man hour" comparisons and "Kiln efficiencies." This can be extended to cover grinding efficiencies. In fact this diagram is not presented as a standard by any means, but more as a suggestion to give the general method. It may be cut down or added to to suit the character of the particular mill.

Is It Too Much Detail?

The first antagonism directed against the installation of such a form will be that it goes into too much detail. The first reaction after it is properly installed and working will be to increase the detail. From this graphic charts may be developed on a daily, weekly or monthly scale, plotted against the budget to show the trend. For this the familiar Gannt chart system is recommended, on account of its compactness and simplicity, though there are other charting systems equally good. Let it be understood though that it is possible to have too much detail, as well as not enough. One institution had over 160 charts concerning costs alone. A thorough investigation and pruning revealed that it was possible to obtain the same results by cutting this number down to five, although it would have been disastrous to cut the five down to four.

This much and more has been tried satisfactorily. There are organizations that go much farther than this and make a practice of informing each foreman frequently as to the costs of his particular department. This not only gives him a definite mark to shoot at, but if he is the right sort of a man for the job, it gives him a feeling that the business of his company is his own business. He will soon perceive that for him to make money the company must prosper.

While it was not the intention to include that suggestion as part of the plan, we will say that nothing can be done to increase the efforts of a good foreman more than responsibility and a profit sharing plan. Make him responsible for the work he does and also for the salary he draws. By profit sharing plan is not meant a bonus in any sense of the word. No man should be bribed to do more work, but he should share in the fruits of his endeavors. The old pick handle is rapidly losing ground as an incentive to loyalty, while the more modern method is constantly coming into its own.

These are but examples of what may be done in the "Battle of Costs." The ideas are neither new nor original, but it will be found that the inauguration of such systems will open the door to information that will be very valuable in this campaign to lower costs.

City Highway Officials Are Organized to Take Part in Road Congress

CAPT. H. C. WHITEHURST, assistant to the engineer commissioner of the District of Columbia, was elected president of the City Officials Division of the American Road Builders Association at the organization meeting held June 8.

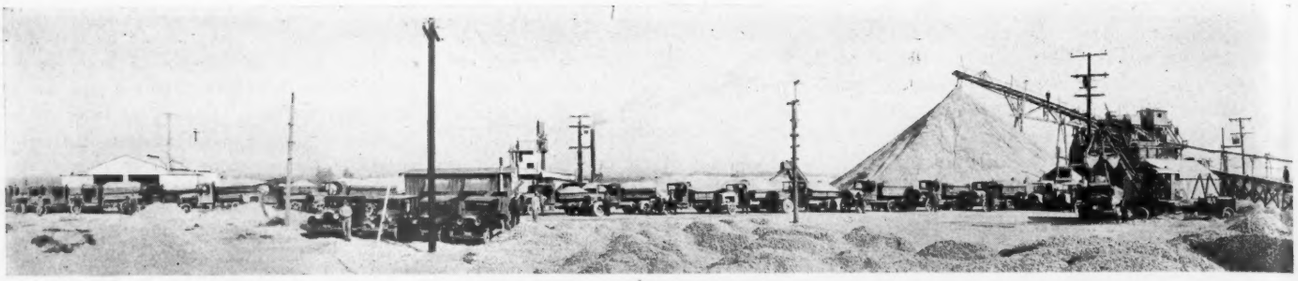
The new division adopted a constitution and formulated plans for carrying out the objectives for which the division was organized. Chairmen of four major committees were subsequently appointed. Captain Whitehurst heads the committee on administration and organization; George B. Sowers, Cleveland, the committee on design and construction; C. E. Myers, Philadelphia, the committee on maintenance, and M. O. Eldridge, Washington, the committee on traffic. Each of these committees will have various sub-committees.

Twenty-four states were represented at the session. Charles M. Upham acted as temporary chairman. Col. R. Keith Compton, chairman of the Richmond, Va., Department of Public Works, addressed the assembly. He told of the need for a city officials' organization and visualized the services it could render to the cities of the United States. Colonel Compton has been a city official for a long period of years.

In addition to the president, the following officials and members of the board of directors were elected:

President, Capt. H. C. Whitehurst, Washington, D. C.; secretary, Chas. M. Upham, Washington, D. C.; treasurer, James H. MacDonald, New Haven, Conn.; vice-presidents, C. E. Myers, Philadelphia, Penn.; Ben S. Davison, Houston, Texas; W. R. Hopkins, Cleveland, Ohio; John C. Shaw, Los Angeles, Calif.

Directors — Robert B. Brooks, J. P. Broome, W. P. Cottingham, R. M. Gregory, W. J. Jamieson, Chas. Henry Moon, Bryson Vallas, A. D. Butler, C. E. Clarke, Thomas B. Crutcher, Wm. A. Hansell, H. C. McClure, H. E. Nettleton, Ira T. Redfern, A. Mason Harris, O. Laurgaard, Thos. B. Oakley, Harry C. Shaner, Nathan L. Smith, Geo. B. Sowers and James H. Sullivan.



The Livingston Rock and Gravel Co. plant on the Rio Hondo river in southern California, showing the large fleet of trucks used in the operation

A Complete Southern California Gravel Operation

Livingston Rock and Gravel Co. Operates Batching and Asphalt Plants to Provide Service for Los Angeles and the Surrounding Towns

By James N. Hatch
Pasadena, Calif.

THE plant of the Livingston Rock and Gravel Co., located on the Rio Hondo river, a few miles south of Monrovia, has one of the finest beds of sand and gravel in the southern California territory. The reports of government and state tests show that the rock from this channel is hard and firm and the sand sharp and clean. The supply appears to be practically exhaustless, and it is a "wash" deposit of an unknown depth. Excavation to a depth of 70 ft. shows no signs of getting through the desirable material. No stripping is required as there is practically no overburden of earth above the gravel bed. Whatever small amount of earth there may be present is washed out at the washing plant without being noticed.

The Livingston Rock and Gravel Co. is composed of W. H. Livingston and his sons, Carder H. and R. W. Livingston. They have been engaged in the rock, sand and gravel business for a number of years, but moved to the present location and built a new plant about three years ago. It is a thoroughly modern and well-equipped plant, and, Mr. Livingston states, it is one of the most economically operated plants in this district. In substantiation of the statement he calls attention to the fact that the plant is operated with only seven men, including the reclaiming crane operator, for a nine-hour shift, and it will turn out 100 tons of material per hour—about 1000 tons per day.

Excavation

The excavating is done with a 3-yd. Bagley scraper bucket, operated by a motor-driven, one-speed Western Machinery Co. hoist equipped with a 150-hp. motor. The bucket is of the common bottomless type. It does not rise from the ground going or coming but hauls the load along the ground and up an incline to the general ground level where it dumps into an underground receiving hopper. A few shots of dynamite are put in just back of the bank and these throw the materials into loose piles where it can be picked up by the bucket.

Pit nearly 70 ft. deep from which gravel is taken by drag scraper excavator

Loaded bucket being drawn up the incline to the belt conveyor

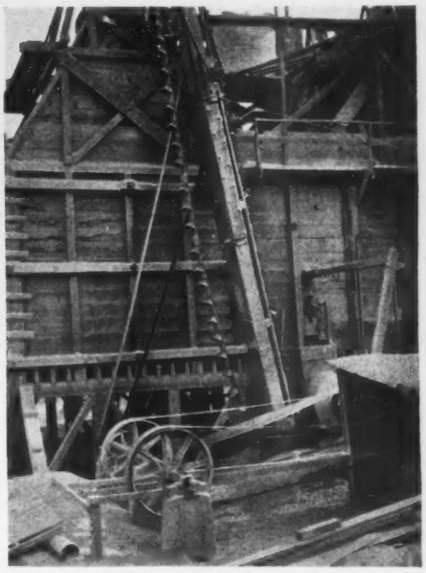
The main belt conveyor from the pit, shown in the left background, to the screening plant

From the receiving hopper the bank material is fed on to a 24-in. conveying belt by a Standard Boiler Co. reciprocating feeder. This belt, driven by a 15-hp. motor, is about 500 ft. long and carries the material up a slight incline to the screening plant and delivers it upon a bar-grizzly with bars set about 3 in. apart.

Crushing, Screening and Washing

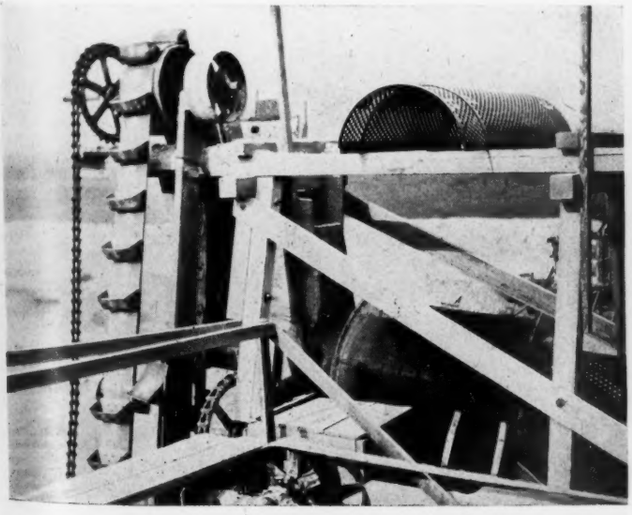
The stones that are rejected over the grizzly fall into a No. 6 Allis-Chalmers primary jaw crusher which crushes them to 2½ in. or less. The material passing through this grizzly is taken by a bucket elevator and elevated 56 ft. to the top of the screening plant. This bucket elevator was supplied by the Conveyor Co. of Los Angeles and has 14-in. pressed steel buckets on a 16-in., 7-ply rubber belt. The bucket elevator delivers the material into a set of Stephens-Adamson revolving screens, where it is thoroughly washed of all dirt and foreign matter and separated through the screens into commercial sizes which fall into storage bins beneath.

The first of these screens has ½-in. round perforations and a jacket for separating the sand. The gravel that passes through the ½-in. perforations and is rejected on the jacket is classified as pea gravel. The material that passes through the jacket is mainly sand. A stream of water is kept running continuously through the screens. The sand and fine stuff passing through the jacket fall into a sluice-box which is kept full of water and running over. The building sand is separated at the sluice-box by a Standard Boiler Co. drag classifier and is taken on a belt conveyor to the top of the sand pile. This classifier is made of a 20-in. rubber belt with 3-in. by 3-in. steel angles bolted on at about 12-in. intervals. It runs at a slow speed and is driven by a 10-hp. motor. One grade of sand only is made at this plant, concrete sand. The fine stuff from the sluice-box is washed away by a stream of water through a long trough and wasted into one of two settling basins, alternately. The material in the settling basins is later reclaimed for use in the asphalt plant as will be referred to later.

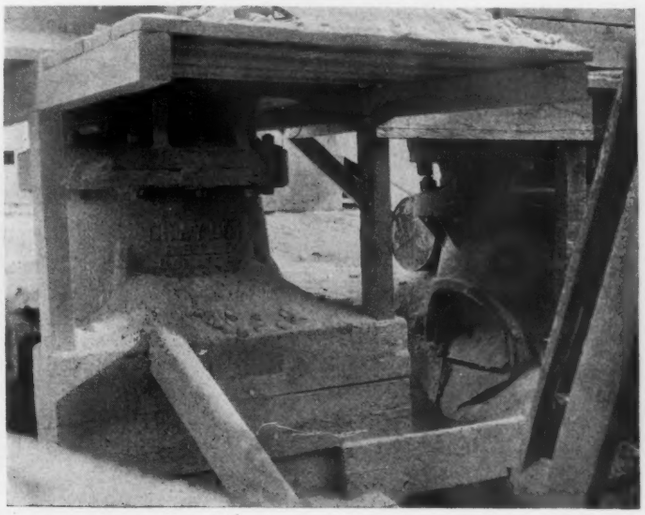


Bypass for material to be re-crushed, elevated, and screened for use in the asphalt plant

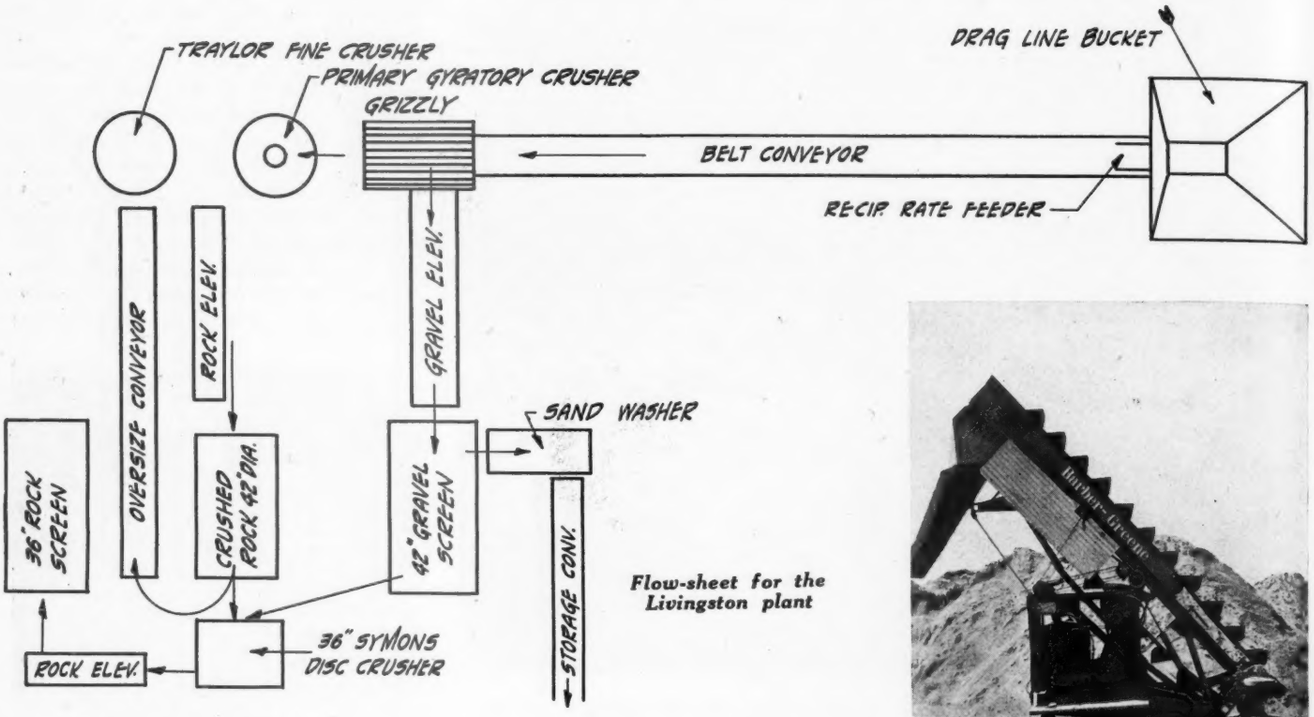
Returning to the screening plant, the second screen has 1¼-in. round perforations



Bucket elevator from the disk crusher, and screens for removing material for the asphalt plant



The primary crusher (right) and the secondary crusher discharge to a common hopper



Flow-sheet for the Livingston plant

and the material passing through this screen is classified as No. 1 gravel. The third screen has 2⅛-in. perforations and produces No. 2 gravel. There are large storage bins beneath the screens for both kinds of gravel. The screen with the 2⅛-in. perforations is the last in the line and the stones that are rejected fall into a chute and go to the secondary rock crusher. This is a 6-in. Traylor "Bull Dog" gyratory crusher and it is located beside the primary crusher so that the materials from both crushers fall into the same hopper.

The discharge from the two crushers is taken by a second line of bucket elevators to the top of the screening plant and passes through a series of screens, similar to the gravel screens. The openings in these screens are, ½-in. for obtaining No. 4 crushed rock; 1⅛-in. for No. 3 crushed rock; and 1¾-in. for No. 2 crushed rock. There is a dust jacket on the first of these screens which takes out the very fine dust. No washing is done in the rock screens; only the gravel and sand is washed. In the near future the company expects to install a scalping screen which will separate the large stone on the ground level so these will not have to be elevated and put through the gravel screens and then brought back again to the crusher.

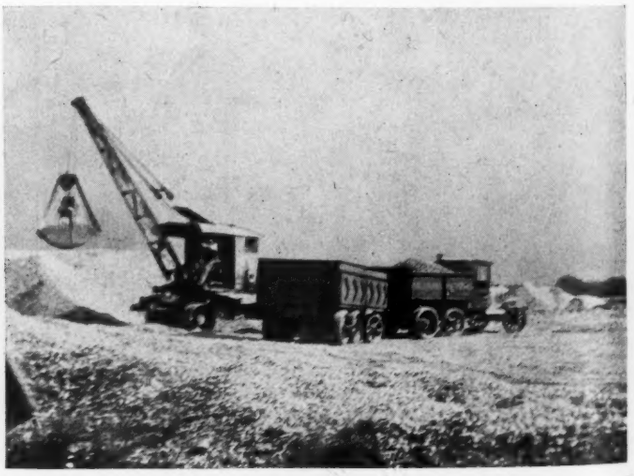
In addition to the above there has been arranged a by-pass so that No. 2 crushed rock and No. 2 gravel can be withdrawn from the storage bins and put through a Symons disk crusher and crushed down to No. 3 and No. 4 crushed rock. This material after being crushed is elevated by a bucket elevator and screened and classified and put into storage for use in the asphalt plant to be described.

Bucket loader reclaiming material from storage piles

Storage

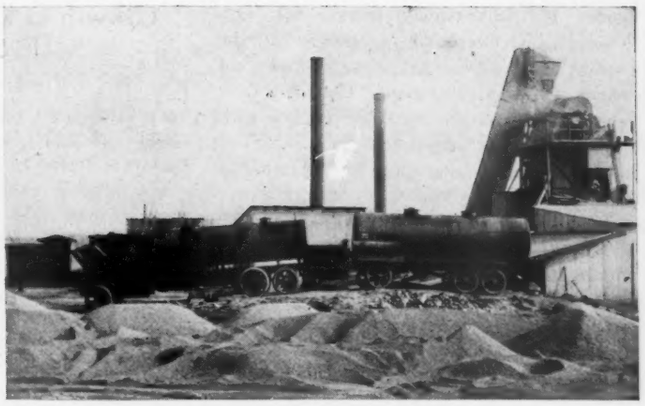
The storage bunkers for gravel and crushed rock, which are beneath the screens, are high enough above the ground so that the trucks can be driven underneath them and the materials let out through gates into the trucks. The gates are sliding steel gates operated by a level at the side of the truck. The sand is taken from the drag-line classifier by a belt conveyor to the top of a sand pile about 70 ft. high. Beneath this sand pile is a tunnel equipped with a belt conveyor which carries the sand out and elevates it so that it discharges into trucks. No gate is required for loading sand on to the belt as the

Tunnel and belt conveyor loader at sand storage pile for loading out of stock pile



Locomotive crane loading material from storage pile to truck and trailer

Batching plant showing loading tunnel



Asphalt tank trucks bringing liquid asphalt to the plant

belt acts as a feeder and feeds itself so long as the belt is running and shuts off the flow of sand when the belt stops. All delivery from this plant is made with trucks.

Materials that are not required at once for delivery are hauled to one side and put into ground storage piles.

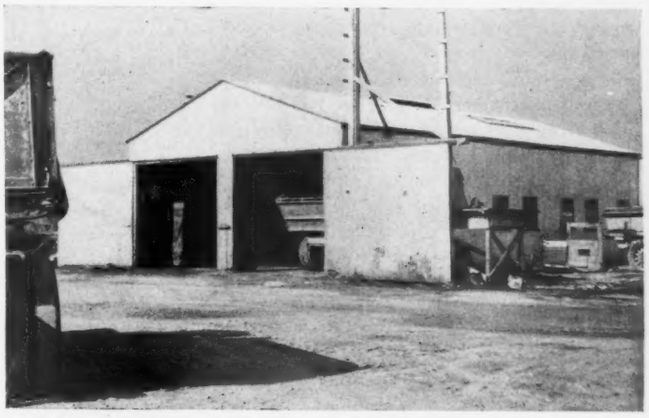
For reclaiming the materials in ground storage the company has a Universal gasoline-operated locomotive crane with a ½-yd. grab bucket, mounted on a Packard truck, also a standard Barber-Greene bucket loader for loading sand that will not feed into the tunnel.

Batching Plant

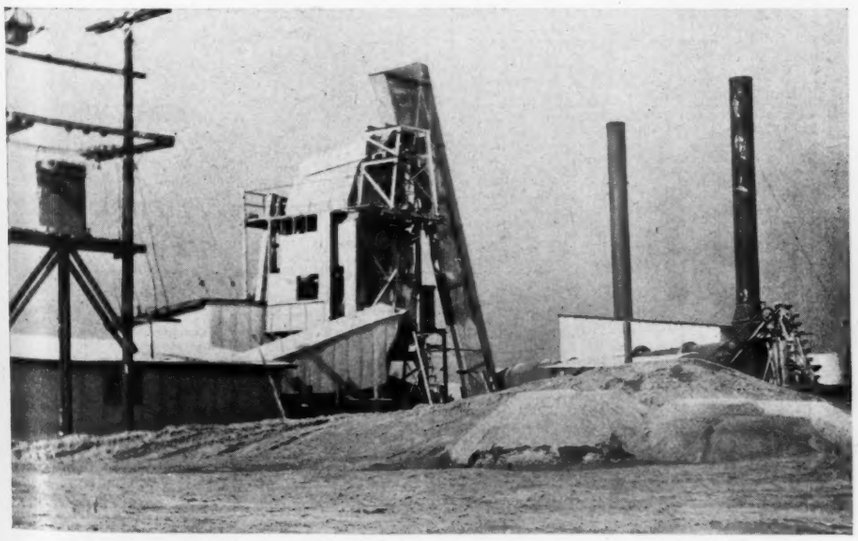
Near the ground storage piles and not far from the large sand pile is located the batching plant. Much of the material to be delivered is first put through the batching plant and sent out to the customer proportioned so that only the cement need be added at the job. Large storage bins with a loading tunnel beneath have been arranged so that trucks can be loaded beneath these bins. The sand and gravel is reclaimed from storage or brought directly from the plant in trucks and dumped into a pit and elevated by bucket elevators into the storage bins. There are three of these, one for sand and one each for the two different sizes of crushed rock and gravel required. Beneath the bins are three different sizes of Johnson measuring boxes, from which the sand and gravel in the required proportions for a specified mix are measured into the trucks. Each truck is divided into compartments holding just enough for one batch in the concrete-mixer to which they are delivering.

Asphalt Plant

Nearby is located an asphalt plant of the Hall-Johnson Paving Co. which is operated in connection with the Livingston plant. In this asphalt plant there is prepared asphalt mixtures of various grades required for road and street paving. The paving company brings the liquid asphalt out here in tank trucks and here it is mixed with the sand and gravel and crushed rock to obtain the various required mixes used for road and street paving. This may be rock-asphalt, sheet-asphalt or any other specified mixture.



Garage and repair shop where the large fleete of trucks are kept in repair



Asphalt plant showing bucket elevator loading into rotary dryer at the right

As mentioned before, the Symons disk crusher crushes the rock and gravel down to No. 3 and No. 4 crushed rock, for use in the asphalt plant. Also the very fine material which is washed from the sluice-box out into the settling basin is reclaimed by the locomotive crane and after being put through a rotary sand drier is used in making paving asphalt. The heat for the dryer is obtained from natural gas in the summer and from fuel oil in the winter when the domestic demand on natural gas precludes its use in industrial plants.

Delivery

The plant is a 3000-lb. batch plant and turns out about 800 tons per day. The Livingston company delivers the prepared asphalt to the jobs with its equipment. The mixed materials are delivered at a temperature of 400 deg. F.

The company maintain a garage and repair shop where all repairs to its trucks are

made. It owns twenty trucks, Sterlings, Kimballs, Kleibers and Morelands. In the repair shop ordinary repairs to the plant machinery can also be made. The roads over which the materials are delivered are generally good paved roads and the trucks can be operated at a good speed and are able to deliver to jobs a considerable distance away.

The markets for products of this plant are Pasadena, San Gabriel, El Monte, Arcadia, Monrovia, Mantello, and the eastern part of Los Angeles. The Livingston company furnished the sand, gravel and crushed rock for the new Pasadena City Hall which was completed this spring. This contract alone required 35,000 truck loads of material.

There is scarcely any waste material from this plant, as the materials as they come from the bank are in almost the correct proportion for the market and with the combination of the asphalt plant even the finest sand and some of the dust can be used. The dust from the dust-jacket is piled out to one side and what is not used for road making around the plant is sold from time to time for filling in property at various places within hauling distance.

Plants in southern California are able to operate throughout the entire year and the market is nearly constant. When the winter rains are over the company moves the excavating equipment over into the bed of the Rio Hondo and operates there during the summer. The winter floods fill this crater each year so that their supply is practically inexhaustible.

The Livingston company leases the land on a royalty basis and has a 30-acre tract under lease. From the top of the plant half a dozen other rock and sand plants can be seen on the nearby desert. The water used is obtained by pumping from a 225-ft. well. The pump used is a Fairbanks Morse & Co. electric-driven centrifugal deep-well pump. Electric power for operating the plant is obtained from the power line of the Southern California Edison Co.

Miners' Pocket-Size Respirators

MINERS' CIRCULAR NO. 30, a U. S. Bureau of Mines publication, describes the use of self-rescuers in aiding miners to protect themselves against poisonous air conditions following mine fires or explosions. Self-rescuers are pocket-size respirators designed to protect the wearer for at least one-half hour against dangerous carbon-monoxide filled atmosphere, thus giving him time to escape from a mine in which a fire or explosion has occurred.

The paper tells about the construction and use of self-rescuers and underground safety systems for distributing them. Descriptions, illustrated with photographs, show the use of these self-rescuers in several mines. The circular, which is entitled "Use of the Miners' Self-Rescuer," contains 26 pages and may be obtained for 10 cents from the U. S. Government Printing Office, Washington, D.C.

Growth of a Missouri Sand Producer

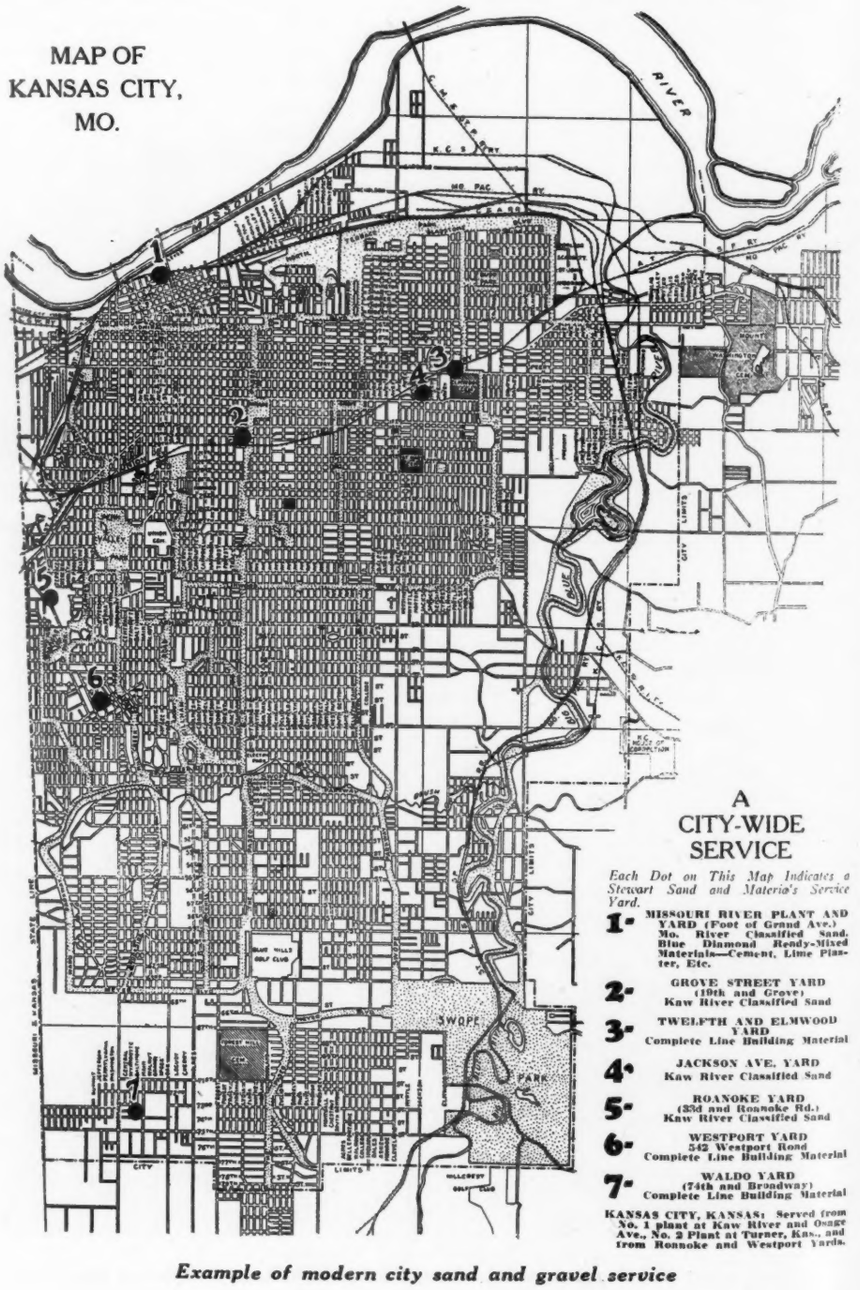
IN THE OLD DAYS anything that was dredged from the river was "sand," regardless of whether it was a fine or coarse aggregate or full of mud balls.

The Muncie Sand Co., Springfield, Mo., was one of the first sand producers to realize the importance of producing a sand to meet the specifications of the best engineers and architects in the construction of buildings and other big projects.

The success of this program has produced phenomenal growth in their business, with the necessary installation of two more plants. They have a capacity of 125 cars a day and produce five different grades of commercial sand for construction work and several other grades for special purposes.

Stewart Sand Company Has Well-Planned Distribution

THE accompanying map of Kansas City, Mo., shows how the Stewart Sand and Material Co. carries out its expansion program for the distribution of its products over the entire metropolitan area. Each yard serves a distinct area and renders the service best fitted to that portion of the city. Although not all of the seven yards in Kansas City, Mo., handle a complete line of all the materials carried by the Stewart company, yet every material is available with no difficulty nor delay to customers in all parts of the city, from the nearest yard which handles that particular product. Kansas City, Kansas, is also well served from any of the four plants that are situated near the boundary between the two cities.


MAP OF KANSAS CITY, MO.
RIVER
SWOPE PARK
A CITY-WIDE SERVICE
Each Dot on This Map Indicates a Stewart Sand and Materials Service Yard.
1- MISSOURI RIVER PLANT AND YARD (Foot of Grand Ave.) Mo. River Classified Sand, Blue Diamond Ready-Mixed Materials—Cement, Lime Plaster, Etc.
2- GROVE STREET YARD (19th and Grove) Kaw River Classified Sand
3- TWELFTH AND ELMWOOD YARD Complete Line Building Material
4- JACKSON AVE. YARD Kaw River Classified Sand
5- ROANOKE YARD (33d and Roanoke Rd.) Kaw River Classified Sand
6- WESTPORT YARD 542 Westport Road Complete Line Building Material
7- WALDO YARD (74th and Broadway) Complete Line Building Material
KANSAS CITY, KANSAS: Served from No. 1 plant at Kaw River and Osage Ave., No. 2 Plant at Turner, Kan., and from Roanoke and Westport Yards.

Example of modern city sand and gravel service

Digest of Literature on Nature of Setting and Hardening Processes in Portland Cement

Part V.—The Chemical Nature of the Setting and Hardening Processes

By R. H. Bogue

Research Director, Portland Cement Association Fellowship,
U. S. Bureau of Standards, Washington, D. C.

THE previous three chapters have been concerned with a consideration of the mechanism by which cements derive their power to set and harden. The present chapter is concerned more specifically with the nature of the chemical reactions which take place when cements are gaged with water. The two points of consideration cannot be separated completely, but for purposes of discussion it seems desirable to treat them more or less independently.

In the researches of Le Chatelier,[15] as recounted in Chapter II of this paper, it was concluded that:

The fundamental reaction which brings about the hardening is the splitting up of a basic calcium silicate into monocalcium silicate and calcium hydroxide:

$$3CaO\cdot SiO_2 + aq. = CaO\cdot SiO_2\cdot 2\tfrac{1}{2}H_2O + 2Ca(OH)_2.$$

There is formed, accessorily, a basic calcium aluminate, the rapidity of hydration of which intervenes in the more or less rapid set of different cements:

$$3CaO\cdot Al_2O_3 + Ca(OH)_2 + aq. = 4CaO\cdot Al_2O_3\cdot 12H_2O.$$

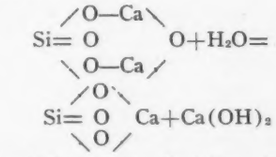
The tetracalcium aluminate was later changed by Le Chatelier to tricalcium aluminate as the product formed under these conditions, but he still believes that the tetracalcium aluminate may be formed under special conditions in a state of metastable equilibrium. "The iron," he stated, "certainly takes no part in the set of portland cements."

These were the simple but direct statements, based upon careful experimentation, which have largely determined opinion on the chemical reactions of the setting process since 1887. Their significance becomes apparent only as the later research is reviewed and compared.

Early Papers

Rich basic slags constituted the subject matter of research by Zulkowski,[43] and largely by analogy he arrived at a theory for the setting and hardening of portland cement. Basic slags rich in alumina resembled portland cement in that they hardened without the addition of lime. Hence, Zulkowski argued that portland cement is only a highly basic silica alumina slag, $4CaO\cdot Al_2O_3\cdot 2SiO_2$, in which there is an excess of free lime present in a "dead-burned" condition.

In order to develop this hypothesis he prepared what he called "hydraulites" which were believed by him to consist of the pure hydraulic compounds of clinker. He regarded the amount of water taken up in the setting process as the most significant criterion upon which to base the constitution of the products. By such a procedure, Zulkowski came to the conclusion that the dicalcium silicate, and this only in one modification, was a true hydraulite. The reaction of this material in the setting process was given as follows:



The hardening of the dicalcium silicate was believed to be due to the formation of the monocalcium silicate which sets under the influence of free lime liberated at the same time and forced into the pores, cementing the matter into a solid mass.

Compositions of CaO with one and with two equivalents of Al_2O_3 were prepared by Zulkowski and were found by him to set quickly with water and to attain a very great hardness. The hydration was believed to result in $Ca(OH)_2$ and a hydrate of alumina, $Al_2O_2(OH)_2$ or $Al_2O(OH)_4$. The iron oxide was thought to be in the form $CaO\cdot Fe_2O_3$ and on hydration to go to $CaO\cdot 2Fe_2O_3$ and $Ca(OH)_2$. Equations written on these assumptions indicated a definite required amount of water for hydration, and on applying these data to synthetic and commercial cements the observed amount of water taken up was found by Zulkowski to correspond with that calculated on the above basis. The same experimentation led Zulkowski to believe that free lime was present, but no $3CaO\cdot SiO_2$.

The theory of Zulkowski was disputed, especially by the editors[44] of *Tonindustrie Zeitung*, who carried on a most interesting debate with him on these theories for some time.

Rebuffat[45] performed a number of experiments which indicated the absence of free lime, but he was unable to obtain $3CaO\cdot SiO_2$, and concluded that such a compound did not exist. On the basis of the work of Le Chatelier and Törnebohm, however, he believed that a composition approaching $3CaO\cdot SiO_2$ was present as the chief constituent, but that this probably was "an indifferent combination of CaO with $2CaO\cdot SiO_2$."

Rebuffat believed that setting consisted chiefly in the hydration of $2CaO\cdot SiO_2$ with the formation of the hydrate $2(2CaO\cdot SiO_2)\cdot H_2O$. Any additional CaO, which might come from an hypothetical composition of $3CaO\cdot SiO_2$, was converted into $Ca(OH)_2$. The alumina he believed to combine with lime in some form less basic than $3CaO\cdot Al_2O_3$ and to hydrate in an indefinite manner. The other constituents, compounds of Fe_2O_3 or MgO, were thought to form small amounts of "indifferent slag-like substances." In cements rich in silica, some $CaO\cdot SiO_2$ was believed to be present and to react with the aluminates to form a double silicate of lime and alumina. The resistance of such cements to sea-water was attributed to these compounds.

To quote from Rebuffat:

In cements of compact texture we may suppose, in the absence of more precise observations, that the orthosilicate is in the amorphous state, and, in contact with water, adsorbs it and crystallizes, perhaps by the intermediate formation of a supersaturated solution. When these cements contain anhydrous aluminates, these hydrate first and produce a rapid set if present in sufficient quantity. . . .

In cements of crystalline texture the set may be due to hydration of the orthosilicates or to the reaction expressed by the equation:

$$2(3CaO\cdot SiO_2) + 3H_2O = 2(2CaO\cdot SiO_2)H_2O + 2Ca(OH)_2,$$

accompanied by the hydration of an aluminate which in the usual portland cement may be almost monocalcium aluminate and which hydrates by fixing $7H_2O$:

$$CaO\cdot Al_2O_3 + 7H_2O = CaO\cdot Al_2O_3\cdot 7H_2O.$$

For portland cement, a final consideration is still necessary. Knapp and more particularly Erdmenger have insisted that portland cement which has set remains coherent on dehydration. That appeared to be a stumbling block for all theories on hydraulicity. We find that the quantity of water fixed by the principal agent of set, the $2CaO\cdot SiO_2$, is small. Hence it is not surprising that it retains its structure when that water is removed. Besides, we know that only part of the water is liberated at low temperatures, the rest being liberated only at bright red heat. The orthosilicate heated to a bright red heat passes from the stable form to the unstable form and dusts on cooling, but if

mixed with aluminates at bright red heat, the hydraulic form of $2CaO \cdot SiO_2$ is stabilized. Hence it follows that a hydrated cement can retain its form on heating.

Feret,[46] on the other hand, agreed with Le Chatelier that $3CaO \cdot SiO_2$ is the essential constituent of clinker. He believed that hardening is due to hydration of the tricalcium silicate, forming $Ca(OH)_2$ and "more or less silica or calcium silicate." Feret regarded as impossible the definite identification of this network of fine unordered crystals.

Review by Meyer

An excellent review of the research on cement was given by Meyer[47] in 1901. As a final result of a study of the various theories that had been presented up to that time, Meyer came to the following conclusions as being most compatible with the experimental information available:

(1) That initial set is caused by the hydration and crystallization of the calcium aluminate. This is present only in small quantities in well-burned cements, but is derived from the basic silico-aluminates through the action of water.

(2) The final set is caused by the beginning of the decomposition of $3CaO \cdot SiO_2$ into hydrated $2CaO \cdot SiO_2$ and $Ca(OH)_2$ according to the equation:

$$3CaO \cdot SiO_2 + 2H_2O = 2CaO \cdot SiO_2 \cdot H_2O + Ca(OH)_2.$$

(3) Hardening is caused by the continuation of the above reaction, followed by the slow transformation of hydrated $2CaO \cdot SiO_2$ into anhydrous $CaO \cdot SiO_2$ and lime:

$$2CaO \cdot SiO_2 \cdot H_2O = CaO \cdot SiO_2 + Ca(OH)_2.$$

(4) Hardening is further advanced by a decomposition of calcium silicoaluminate into silicate and hydrated aluminate. Two reactions then follow:

(a) Combination of hydrated aluminate with the $CaO \cdot SiO_2$, and

(b) Partial carbonation of hydrated lime.

(5) The Fe_2O_3 plays no role either in the set or in the hardening of portland cement.

(6) The direct cause of hardening is the crystallization of the hydrated dicalcium silicate from a solution which is supersaturated with respect to this substance. The crystallization of the $Ca(OH)_2$ contributes only in small measure to the hardening process.

(7) Active hydraulic materials which can combine with $Ca(OH)_2$ may greatly increase the strength.

Meyer also entered into a lengthy discussion of the structure of the silicates, and concluded that on theoretical grounds it was much simpler to accept the existence of $3CaO \cdot SiO_2$ in anhydrous cement than that of dicalcium silicate with free lime.

Leduc,[48] however, was convinced that dicalcium silicate was the essential hydraulic material of portland cement as well as of some natural cements. An interesting observation was made that on long continued heating at relatively low temperatures, certain changes were effected in the appearance and volume constancy of the subsequently prepared set cement, and were attributed to a breaking down of the more basic compounds to $2CaO \cdot SiO_2$ and $2CaO \cdot Al_2O_3$, with liberation of CaO. The free CaO produced swelling and checking of the set cement.

Solid Solutions

The conception of solid solutions of aluminates in the silicates was developed by Richardson.[49] Following a careful study of many compositions, systematically varied, and a comparison of the products with the constituents of portland cements as designated by Törnebohm, Richardson came to the conclusions set forth below:

If the mixture is of high basicity, one in which the hydraulic modulus, $\frac{CaO}{SiO_2 + R_2O_3}$, is close to 3, the product will consist essentially of a solid solution of $3CaO \cdot Al_2O_3$ dissolved in $3CaO \cdot SiO_2$. This material he identifies as "alite." The concentration of the aluminate in the silicate may vary, however, over a considerable range, and the properties of the product, and especially the burning conditions, may be modified accordingly.

If the raw mixture has a lower basicity, one in which the hydraulic modulus lies between 3 and 2.5, there will be produced, in addition to the "alite," a solid solution of $2CaO \cdot Al_2O_3$ in $2CaO \cdot SiO_2$. This material Richardson identifies as "celite." Here also the concentration of the aluminates may vary and affect the properties of the product and the burning conditions. Most portland cements would be so constituted that there would be formed a mixture of the two solid solutions, or, to use Törnebohm's nomenclature, a mixture of "alite" and "celite."

Since the properties of a cement may be defined by a statement of the basicity and the concentration, Richardson suggests that cements be classified as mild, medium or hard (referring to the Al_2O_3 content) of high, medium or low basicity. Thus "mild" cement of high basicity will set very slowly and have great tensile strength. All "hard" cements will set very rapidly and heat on mixing with water. Between these two extremes the cements will have properties dependent both on the concentration of the aluminates and on the basicity." When the aluminate concentration becomes higher than that represented by $2(3CaO \cdot SiO_2) : (2CaO \cdot Al_2O_3)$ a pronounced change in structure results and Richardson regards this as the formation of a eutectic of four solid solutions:

$3CaO \cdot Al_2O_3$ in $3CaO \cdot SiO_2$,
$3CaO \cdot SiO_2$ in $3CaO \cdot Al_2O_3$,
$2CaO \cdot Al_2O_3$ in $2CaO \cdot SiO_2$,
$2CaO \cdot SiO_2$ in $2CaO \cdot Al_2O_3$.

When water is introduced, the equilibrium between these solid solutions is disturbed and calcium hydroxide is liberated. The set is attributed to the crystallization of the calcium hydroxides from the aluminates, and the subsequent hardening to crystallization of calcium hydroxide from the silicates. Thus Richardson believes that the strength of a cement mortar or concrete is due almost entirely to the crystallization of calcium hydroxide and not at all to the hydration of the silicates or aluminates.

Various factors which bear upon the rate of hardening have been discussed by Rohland,[24] but he is very indefinite in his opinion of the reactions which are responsible for the hardening process. He says:

There certainly is a constitutional change during hardening, although investigators are not agreed on the explanation. . . . It seems certain that the hardening process consists of reactions between materials in the solid state at ordinary temperature, a reaction which is possible because of a former pyrochemical state.

Rohland believes that portland cements may contain as much as 30% of free CaO and that the hydraulic activity of the cement is due to a reaction of this with undissociated silicic acid, in the colloidal form, which also he believes must be present.

Staining Methods

Keisermann[50] felt that previous investigations of the processes of hydration had not yielded satisfactory results because the hydration products had not been definitely identified. Accordingly, he studied the staining of various silicates and aluminates and as a result claimed "it was easy to distinguish with absolute certainty the various formations of Al_2O_3, CaO and SiO_2." The reagent for Al_2O_3 was patent-blue; for CaO, alcoholic anthrapurpurine; for free SiO_2, neutral methylene blue; for combined silicates, acetic acid solutions of methylene blue.

Keisermann found that in the hydration of calcium silicates, needle crystals were formed which were monocalcium silicate hydrate. There was formed at the same time as a result of the above hydration, and likewise in the hydration of portland cement, a colloidal mass which he believed also consisted of monocalcium silicate hydrate, free from Al_2O_3.

Large hexagonal crystals were found to consist of $Ca(OH)_2$. Small hexagonal plates were found to consist of $3CaO \cdot Al_2O_3$.

Hence Keisermann concluded that clinker consists of $2CaO \cdot SiO_2$ and $3CaO \cdot Al_2O_3$ existing separately in the approximate ratio of 4 mols of the silicate to 1 of the aluminate. Very little free lime was found.

The hardening of the cement was explained as being due entirely to the hydration of the $2CaO \cdot SiO_2$, the fine needles of the $CaO \cdot SiO_2$·aq. becoming interlaced and penetrating the gel of the same composition. The gel on hardening further cemented the crystals together. The $3CaO \cdot Al_2O_3$ was thought to play no part in the hardening process, but its action as a flux prevented the dusting of the clinker on cooling and accelerated the hydration of the silicate.

Microscope Methods

Ambronn[51] studied the behavior of cement during set by placing a small portion of powdered cement on a microscope slide with water, and keeping under a bell jar containing water to prevent evaporation. During the first few days the individual particles of cement were seen to become surrounded by a large number of very fine needles and hexagonal plates, both of which showed nega-

tive double refraction. These crystals were not identified. Calcium hydroxide crystals consisting of large hexagonal plates developed after a few days, and, if carbon dioxide were not excluded, "biscuit shaped" crystals of calcium carbonate appeared. After some time these were clouded over with a colloidal film which obscured the crystals.

Read[52] studied the hydration of cements in a similar manner on a microscopic slide, but he cemented a cover glass on to the slide to exclude carbon dioxide and prevent evaporation. There were observed three types of crystal formation which he claimed to be as follows:

(1) Tetracalcium aluminate. These crystals twinned readily through the center of two opposite sides of the hexagon, forming complex star-shaped aggregates.

(2) Calcium sulfoaluminate. These crystals were believed to result from added gypsum or from sulfate present in some of the stack kiln cements.

(3) Calcium hydroxide hexagonal plates.

Kühl[25] believed that a tetracalcium aluminate was formed in the hydration of the aluminates in cement, but Radeff[53] could find no evidence for the existence of such a highly basic aluminate. The end product of hydration of $3CaO \cdot Al_2O_3$ and also of $CaO \cdot Al_2O_3$ and $5CaO \cdot Al_2O_3$ was found to be a hydrated tricalcium aluminate, provided, in the latter cases, there was sufficient lime in the system.

Malgrain[54] has attempted to define the factors which cause a cement to set and harden. He lists, first, hydration, which takes place rapidly and is complete in a few hours (corresponding to set); second, desiccation, which occurs when the hardening takes place in air and is complete in a few weeks; third, carbonation, during which period the lime pre-existing in the cement and that liberated in the reaction becomes carbonated, and which lasts several months; fourth, recrystallization, in which process the hydraulic products are said to change in structure, forming a much harder material.

Summary of Klein

The researches on the setting of cements which were conducted at the Bureau of Standards[55] from 1914 to 1917 have been summarized by Klein as follows:

The hydration of cements is brought about by the formation of amorphous hydrated tricalcium aluminate with or without amorphous alumina, the aluminate later crystallizing. At the same time sulfoaluminate crystals are formed, and low-burned or finely ground lime is hydrated. The formation of the above compounds begins within a short time after the cement is gaged. The next compound to react is tricalcium silicate, whose hydration begins within twenty-four hours. Between seven and twenty-eight days the amorphous aluminate commences to crystallize and betaorthosilicate begins to hydrate. Although the latter is the chief constituent of the American portland cements, it is the least reactive compound. The early strength (twenty-hour hours) of cements is probably due to the hydration of free lime, the aluminates, and the beginning of tricalcium silicate hydration. The increase in strength between twenty-four hours and seven days depends upon the hydration of tricalcium silicate, although the further hydration of aluminates may contribute somewhat. The increase between seven and twenty-eight days is due to any further hydration of tricalcium silicate and to the beginning of hydration of betacalcium orthosilicate, but here are encountered opposing forces, in the hydration of any high-burned free lime present and in the crystallization of the aluminate. It is to this hydration that the falling off in strength between seven and twenty-eight days of very high-burned high-limed cements is due, whereas the decrease shown by the high alumina cement is due to the crystallization of the aluminate.

The dicalcium silicate hydrates to a very granular porous mass which allows of ready egress of solutions, and while it is chemically more resistant to the actions of solutions than the tricalcium silicate, yet it furnishes a great number of voids in which salts may crystallize out of solution, and it is consequently very little able to resist the mechanical action of the "freezing out" (crystallization) of salts from solution.

On the other hand, the hydrated tricalcium silicate with its very dense structure, composed of gelatinous (colloidal) silicate interspersed with crystals of lime hydrate, is probably very susceptible to strains produced by alternate wettings and dryings, colloidal material of this kind being subject to considerable volume change resulting from slight moisture changes.

It appears, therefore, that the composition of portland cement should be along lines which would not produce a great preponderance of either silicate. The ideal cement should possibly have an excess of the dicalcium silicate, which would give a not too dense hydrated material, gaining strength at later periods. A lesser amount of tricalcium silicate would furnish the desired early strength and also overcome the excessive porosity of the dicalcium silicate.

The special influence of the lesser components on the setting and hardening processes have been studied by a number of investigators, but the chemical nature of their action has not been explained. Since the information on these materials is essentially empirical, it will not be considered at this time.

Summary

Exact information on the chemical nature of the major reactions which accompany the setting and hardening of cement has not been advanced materially in the last quarter century, and indeed but few contributions have appeared which would change in any considerable degree the conclusions reached by Le Chatelier on this problem, in 1887. It is true that contrary views have been expressed, but for the most part these have lived but a brief while, to be rejected for the older point of view. It seems astonishing that the investigations of forty years still have failed to reveal any great errors in the scientific reasoning of Le Chatelier, evolved under the meager and trying conditions of experimentation which existed at that time. The more extended summary of information as set down by Meyer in 1901 differs but little in essential features from the summary of Klein, 1914-17, and nothing has appeared in the literature since the latter date which would materially modify those views.

These conclusions may be stated briefly as follows:

(1) The aluminates are first to hydrate, forming amorphous hydrated tricalcium aluminate. Crystals of calcium sulfoaluminate are formed with the calcium sulfate. Most of the free lime is rapidly hydrated.

(2) Hydration of tricalcium silicate begins within 24 hours. This is responsible for strength between 1 and 28 days. The amorphous aluminate begins to crystallize and tends to cause retrogression of strength.

(3) Dicalcium silicate hydrates slowly, and is responsible for increasing strength after 28 days.

Serious effort in arriving at a more complete understanding of these processes is now being directed to the more precise determination of various factors. Among these may be mentioned: The rates at which the several reactions proceed; the inner mechanism of the reactions by which hydrolysis and hydration are differentiated and more minutely comprehended; and, finally, the reactions of the less abundant compounds of the cement with water and the influence of the resultant changed conditions in the system, and the products, upon the major reactions in the development of the essential hydraulic materials. Intelligent control of the processes of setting and hardening can be attained only when this information is discovered and applied. Very little has been reported in the literature of such comprehensive studies; that, however, is one of the objectives of our own research.

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(To be continued.)

Bond in Slag and Slag Concrete

SYMPOSIUM NO. 5, of the National Slag Association, H. J. Love, secretary, has been issued under the title "Bond in Slag and Slag Concrete." It consists of a collection of brief abstracts from many sources on "Bond," "Cementation," "Surface Area," "Texture," "Solubility," "Fracture," "Shape," "Density." The editor and compiler further defines "bond" as one of two things: (1) The power of adhesion between steel reinforcing and concrete, determined by a test in which a length of steel bar is either pushed through or pulled out of the concrete surrounding it: (2) The power of adhesion between the aggregate and the mortar in the concrete.

The symposium contains little on the first except a table comparing the bond in slag concrete with the bond in concrete made with other aggregates. Under "Bond of slag with mortar in concrete" there is much valuable information.

Utilization of Anhydrite in Cement Retardation

THERE is a wide variation in the physical properties of anhydrite as it occurs in nature, and since only one sample of anhydrite was utilized by the United States Bureau of Mines in its former investigation concerning the action of anhydrite as a retarder for portland cement, the bureau was urged to conduct further work to determine whether the type of anhydrite or its degree of fineness might not have an appreciable effect upon its action as a retarder. The tests which were originally outlined to cover this problem have been practically completed.

The information obtained so far seems to justify the following tentative conclusions:

It is practically essential that the clinker and retarder be ground together if consistent results are to be obtained in any investigation of this type.

The type of anhydrite has no marked relation to its action as a retarder, but the fineness of the retarder is of considerable importance, particularly as regards its effect upon the plasticity of the cement.

If the cement is properly retarded, all forms of calcium sulphate will produce practically the same quality of cement.

While cement of good quality has been obtained by using anhydrite as a retarder, the variation in the properties of the cement clinker itself makes it essential that information be obtained concerning the retarding action of calcium sulphate before stating definitely which form, if any, is the most efficient retarder for portland cement clinker.

English Sand and Gravel Plant Has 50-Ft. Rotary Screen

THE THAMES VALLEY SAND AND BALLAST PITS, Shepperton-on-Thames, with an area of approximately 40 acres, are situated on the main Chertsey, Laleham and Staines roads. An excellent and thoroughly consolidated road approach thereto has been made.

The plant is laid out with due regard to the importance of quick loading and dispatching, having a 30-ft. wide concrete road in and out, on either side of which are grading and storage bins. The loading will be carried out by means of a "Smith's" 5-ton loco crane and grab, a 75-lb. per yd. rail track being laid between the bins for this purpose.

The material is raised by means of a suction dredger consisting of a "Gwynne" centrifugal pump operated by a 200-h.p. Ricardo petrol engine, with a 16-in. belt drive, both mounted on a 24-ft. by 14-ft. floating pontoon, with 8-in. wrought-steel pipeline. This pipeline is connected to a ball joint on the top of the pump and runs along the edge of the pit and up to the discharge, or boiling, box situated at one end of a rotary screen 5-ft. diameter by 50-ft. long. The screens have been supplied and erected by Messrs. Gwynne Pumps, Ltd., of Lincoln, and are perforated for grading in three sizes of stone, viz:—⅜-in., ¾-in. and 1¾-in., and rotates at a speed of 9½ revolutions per minute. It is chain hung from an overhead shaft. The output of the pump, consisting of about 80% water and 20% material, discharges on to an inclined screen fitted in the bottom of the boiling box, through which water, with the sand in suspension, is carried away down a chute into the sand bins. The stones slide down the inclined screen into the rotary screen and are graded to the sizes mentioned, passing from thence into their respective bins. The rejections pass out at the end of the screen into a bin provided for their reception. The material is thoroughly washed while passing along the pipeline, and further supply of clean water is discharged from a spray-pipe in the rotary screen at the rate of 300 gal. per min., being lifted by a small centrifugal pump from a well specially sunk for this purpose. The fronts of the bins are fitted with perforated screens which permit the water to drain away leaving the sand and stones behind. The water is carried back to the pit by a concrete gully or launder, pasing through a settling pit arranged to trap the fine sand. In the event of the material being required "as raised" provision has been made for its discharge and storage.

The crane lifts 5 tons at 16-ft., 3 tons at 20-ft. radius and is also arranged for operating a single chain grab for working under water, the gross load of grab and contents being 3 tons at 18-ft. radius, or a gross load when grabing of 2½ tons at 20-ft. radius. The grabs supplied with the crane being 20 and 27 cu. ft. capacity, respectively, the 20-cu. ft. grab being of the whole-tine type. This crane has been supplied and erected by Messrs. Thomas Smith and Sons (Rodley), Ltd.

With regard to the output, the plant is capable of producing 60 tons per hour of ungraded material and about 50 tons of washed and graded material per hour. Ample reserve storage bins have been provided to ensure an adequate supply of all grades. The essential factors for making good concrete is the cleanliness and grading of the aggregate, which is quite as important as the choice of the cement for making the concrete. London is particularly well endowed with numerous deposits of "river bed" ballast and sand, which are now being exploited by numerous firms in order to meet the demand of engineers and architects, by whom it is becoming increasingly specified. Mechanical tests clearly indicate this product to be one of the finest concrete aggregates procured in this country.

The property is owned by Messrs. C. Edwards (Southern), Ltd., Builders Merchants and Contractors of London, Brighton, Hove, Portslade, Eastbourne, etc., and the London sales will be directed by Mr. L. S. Cadic, late commercial manager of Messrs. Lafarge Aluminous Cement Co., whose office is situated at 66, Victoria Street, Westminster, S.W.1. The company has also storage accommodations on the Southern Railway at Nine Elms Wharf, S.W.8.—*The Contract Journal* (London, England).

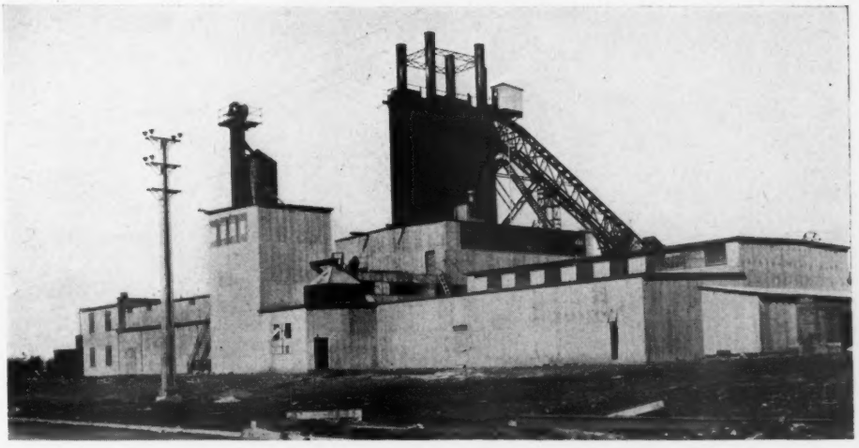
Manufacture of Nonmetallic Minerals in Canada in 1927

MANUFACTURES of nonmetallic minerals in Canada during 1927 were valued at $172,898,251. This is the output of 1180 factories, the capital investment of which was $271,832,330, an increase of $10,000,000 over 1926. Seventeen industries were included in the nonmetallic group and of these 12 showed an increase and five had a decrease over the previous year. Glass showed an advance of 18.5%; portland cement, 10.6%; cement products and sand lime brick, 10%; asbestos products, 9%; brick and tile, 8%; lime, 4%; products from imported clays, 2.5%, and fireclay, 1.2%. Decreases were recorded by monumental and ornamental stone, 4%; stoneware and pottery, 3.6%, and clay sewer piped down, 3%. Imports of nonmetallic products in 1927 were valued at $155,404,666.

Thomaston, Maine, Lime Plant of the Lawrence Portland Cement Co.

Two Vertical Semi-Automatic Kilns, with Time Controlled Stoking, Produce About 100 Tons Daily

LATE in 1926, the New England Portland Cement and Lime Co. sold its quarry property and lime plant at Thomaston, Maine, to the Lawrence Portland Cement Co., Siegfried, Penn. The quarry property consisted of 600 acres of partially proved limestone land on which a quarry working had been developed for kiln stone. The lime plant had just been completed and was not in full operation at the time of the sale, but by November, 1926, the last few difficulties had been ironed out and since that time it has been operated successfully.



Thomaston, Me., lime plant of the Lawrence Portland Cement Co.

The lime quarry locally called the Stackpole quarry is one of the best known in the section. The limestone vein is about 150 ft. thick in some places, narrowing down to 40 ft. in others. All varieties from rock soft enough to be broken between the fingers to that so hard that it breaks with conchoidal fracture are present. The formation is one of which the origin is in doubt, no fossils of any kind being found in the rock.

At the present time the quarry is being developed in two levels. The upper has a circular face about 800 ft. long and from 45 to 60 ft. high. Part of the floor on this level has been broken down to make a lower level with a 30 ft. face. An overburden of clayey topsoil, 10 ft. in thickness is removed by an Erie steam shovel and carried to a dump. Holes are put down by a Loomis Clipper drill to a depth of 14 ft. and loaded with 40% du Pont gelatine. The usual spacing is about 15 ft. from the face and with a burden of 20 ft. After the blast, the larger sized rock is broken down to kiln size by sledging and pop-shooting. All the loading for the kiln stone is by hand on the quarry floor where it is also sorted.

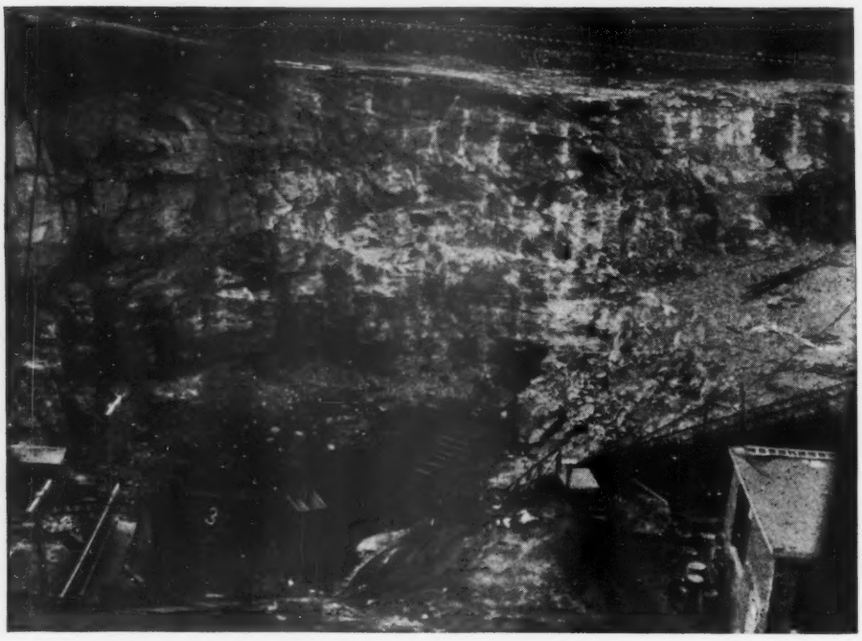
Two lines of narrow gage track have been put in place on the floor of the upper level. These lines extend parallel to each other from the face of the quarry to a point near the foot of a skipway where they converge. The quarry cars are of all-steel construction, two-way dump type and hold 3½-yd. They were furnished by the Easton Car and Construction Co., Easton, Penn. After loading, the cars are hauled by a small single-drum air-hoist (Ingersoll-Rand) to the foot of the skipway from where they are pulled up the skipway to the top of the kilns by a Lidgerwood single-drum electric hoist operated by remote control from a tower at the top. The hoist is driven through a train of gears by a Westinghouse 80-hp. 440-v., 860 r.p.m. electric motor and is equipped with a Cutler-Hammer solenoid brake. The skipway is laid on a footwall of the limestone vein and has a pitch of 30 deg. From the bottom of the lower level to the top of the kilns, the stone is raised to a height of almost 200 ft.

Part of the upper quarry face showing the stratification

There are two vertical Schaffer kilns, each 90 ft. high from the firing floor and 17 ft. 3-in. outside diameter. Each kiln holds about 370 tons of stone when full and produces from 45 to 50 tons of lime in 24 hours. The tops of the kilns are fitted with counterweighted steel doors through which the stone is fed. There are two doors to each kiln, one on either side of the loading track which runs through the center. One steel door on each side between the kiln doors opens to a steel coal bunker holding about 75 tons, built between the kilns and extending from the top of the kilns to a height of about 15 ft. above the firing floor. The walls of this bunker have been carefully insulated to preclude any possible chance of the coal being ignited by the heat passing through the kiln jacket which forms part of the bunker structure. The bunker is filled by the same system used in carrying stone to the kilns.

In view of this method of storing the coal

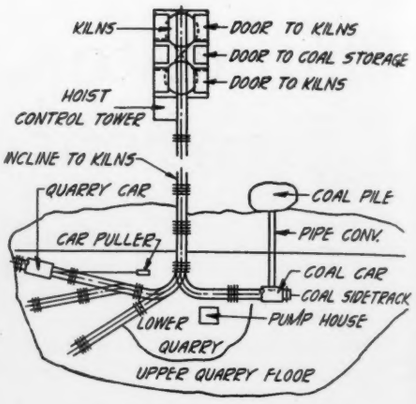
for the kilns, an efficient system of outside storage for coal has been developed. Coal is brought in on the side track by the gondolas or hopper-bottom railroad cars and dumped to a track hopper. This hopper is served by a conveyor belt running in an underground tunnel beneath the tracks and feeding the coal crusher. The coal is reduced to ¼-in.-½-in. and falls through a hopper to an open conveyor in a loader frame which builds a conical stack at a point near the edge of the quarry. The stack lies over a hopper set below the quarry face, and this hopper feeds to a circular sheet iron pipe, 12 in. in dia. and about 40 ft. long, set on a trestle following the quarry face to the upper quarry floor. A short spur of quarry track has been built so that cars can run to the mouth of the pipe conveyor and, after loading, be pulled to the skipway and hauled to storage as described. The accompanying sketch shows the entire track layout and illustrates the scheme thoroughly.



Looking down the incline into the upper and lower quarries

A little trouble has been experienced with water seeping through natural courses in the rock to the lower quarry but the two centrifugal pumps of 750 g.p.m. each, installed in the pump house, have ample capacity to take care of this. Both pumps are electrically operated, the Gould centrifugal by a 30-hp. Westinghouse motor and the Lee-Courtney by a Wagner 20-hp. motor.

Both kilns have four furnaces, two in front and two in the rear, each equipped with stokers operated automatically by an oil-pressure system controlled from an electric time clock. The firing times are fixed in the clock for the 24 hr. day and at the set intervals the desired amount of coal is passed to the fire boxes of the kilns. A 7½ hp. General Electric induction motor drives the Hele-Shaw oil pump for this system. The stokers were furnished by the McGlone-Brooks Co., Scranton, Penn., and the electric operating systems installed by the International Time Recording Co., Endicott, N. J.



Track layout (not to scale)

Kiln Firing

The hoppers above the stokers are filled by an Easton weigh car of 1200 lb. capacity running on a track above them. A quadrant gate in the bottom of the storage hopper feeds the coal to the weigh cars and both the gate and the dumping of the car to the stokers is controlled from the firing floor by the kiln operator. Occasionally the heat at the bottom of these stoker feeders is so intense that there is danger of the coal being ignited before it is fed to the fire boxes so the fireman as a precaution wets it down at this point by a small jet of water.

When the plant was taken over, Mr. Davis, the present superintendent, found the kilns were not delivering the capacity they should. A check-up on conditions brought about the fact that the drawing intervals were too far

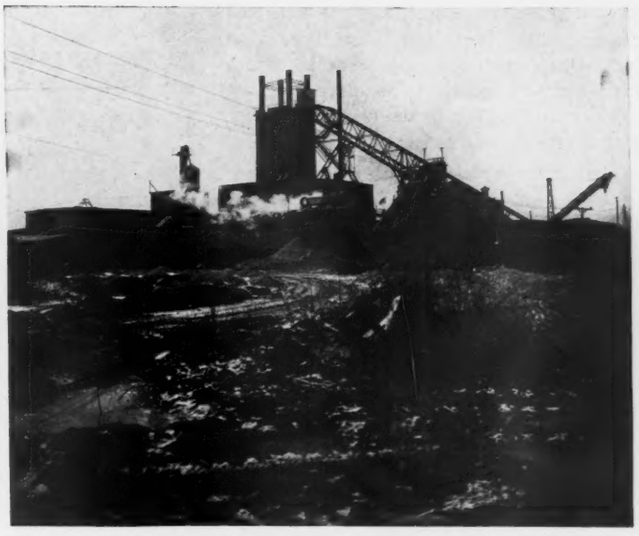
Discharge end of the coal chute

Fixed loader stock-piling coal. The tunnel hopper and coal chute shows at the left

The quarry of the Lawrence plant, showing the track layout

Another view of the quarry showing the two levels

General view of the lime plant with the cement mill under construction in the foreground

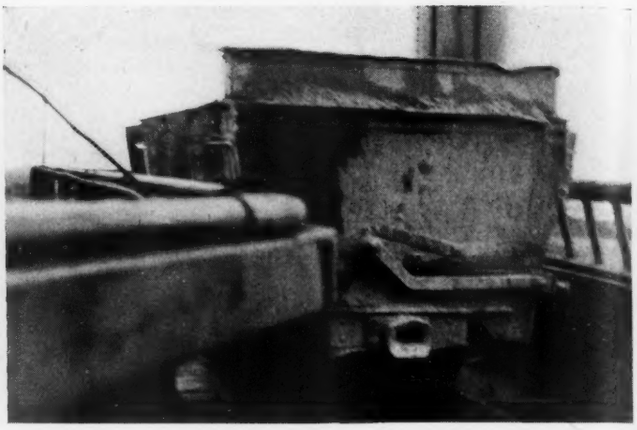


View of the Thomaston plant, with the coal storage pile showing to the right of the kilns

Packing department at the Thomaston plant

A view in the shipping department

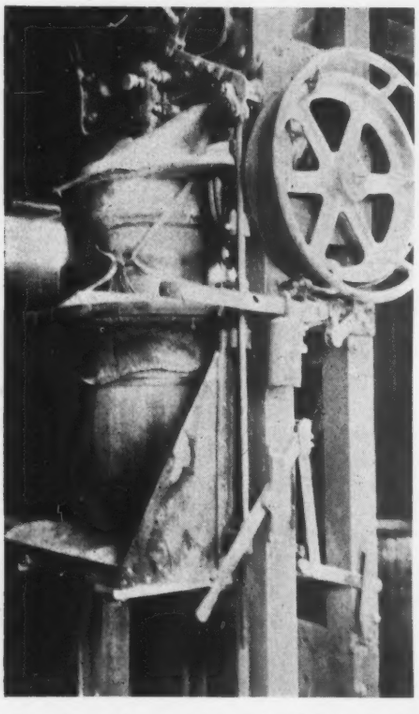
End of the incline over the kilns



Quarry car in dumping position over the kilns

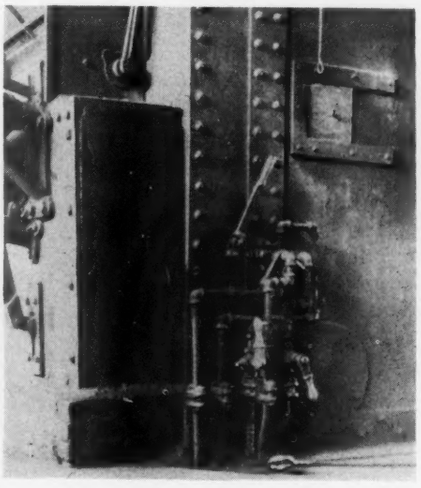
apart. By making a few changes and shortening the interval from every 3½ hours to every hour, the capacity was brought up to expectations and the quality of the lime was better than before. At the same time the amount of steam admitted to the kiln was changed with beneficial results. The steam and air are now put in under the grates with sufficient pressure to carry the hot gases from the fire boxes to the calcining zone 26 ft. above the fire level.

The draw shears are of the clam-shell type suspended below the firing floor and sufficiently high above the picking floor to allow the drawn lime to fall into 1-ton steel trucks if desired.

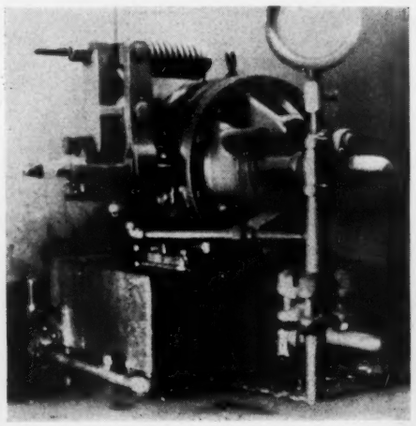


Barrel packer in the pulverizing plant

The drawing is accomplished from the firing floor by the fireman and through the same oil pressure system used in firing. On signal from the picking floor below, the fireman pushes a lever along the side of the kiln to open the shears, and closes them by another lever when he is satisfied the kiln has been fully drawn. Since he has the kiln under observation all the time through one of the eyes he can safely judge the length of time for the draw although he cannot see the drawn lime.



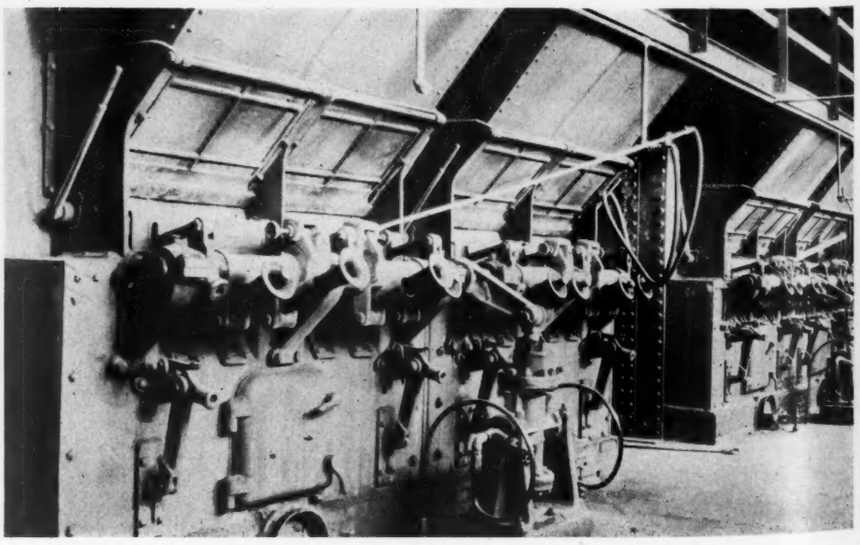
Control levers for stokers and draw shears



The pump for the oil-pressure system of stoking and drawing

Ashes from the fire boxes are withdrawn from the grates to steel hoppers under the firing floors where they fall to trucks backed under the hopper and are carried away to the dump.

On the picking floor, the lime is sorted,



Automatic stokers on the fire boxes of the kilns

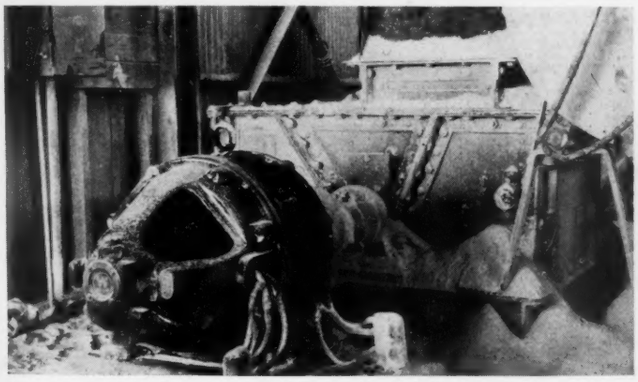
weighed and either barreled as lump lime or shoveled on a wheelbarrow and taken to a floor hopper which feeds the 12-in. pan conveyor running to the pulverizer. The conveyor is driven through a train of gears by a Westinghouse 7.5-hp., 870 r.p.m. 440-v. electric motor. A Pennsylvania hammer mill direct-driven by a Westinghouse 50-hp. motor is used for crushing the lime to the required fineness which at this plant is 60% through 100 mesh. The crushed lime passes through a hopper to an enclosed screw and is carried to the foot of a Link-Belt Co. belt and bucket elevator which elevates it to a 40-ton conical steel bin. From this bin it is fed by a small screw feeder to two Hummer screens. The oversize of these screens goes back to the mill for regrinding and the throughs pass by screw conveyor to packing bins. The speed of the feeder to the screens can be carefully regulated, a Reeves No. 000 variable transmission being used with the 3-hp. driving motor for that purpose. The controls for the conveyor, feeder, elevators and the main switch are placed on one of the walls of the screening room and all are readily accessible.

Pulverized lime is packed in paper-lined wooden barrels holding 280 lb. by two "Mogul" barrel packers, furnished by S. Howes Co., Silver Creek, N. Y. A 7.5-hp. Westinghouse motor drives both the packers.

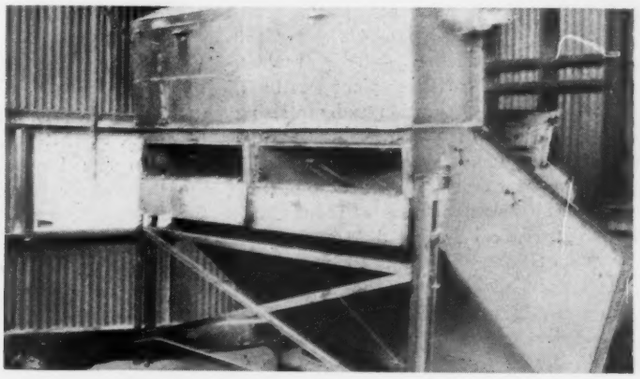
Floor hopper and pan conveyor feeding the lime pulverizer

The blacksmith shop is housed in a small structure at the face of the quarry. It has the usual forge and a small Ox-weld welding outfit, a Sullivan Class C drill sharpener and other equipment. An Ingersoll-Rand 12 x 10 compressor driven by a 65-hp. General Electric motor furnishes air for the jackhammers in the quarry and for the small air hoist. There is also a 50-hp. coal-fired steam boiler to supply steam for the kilns.

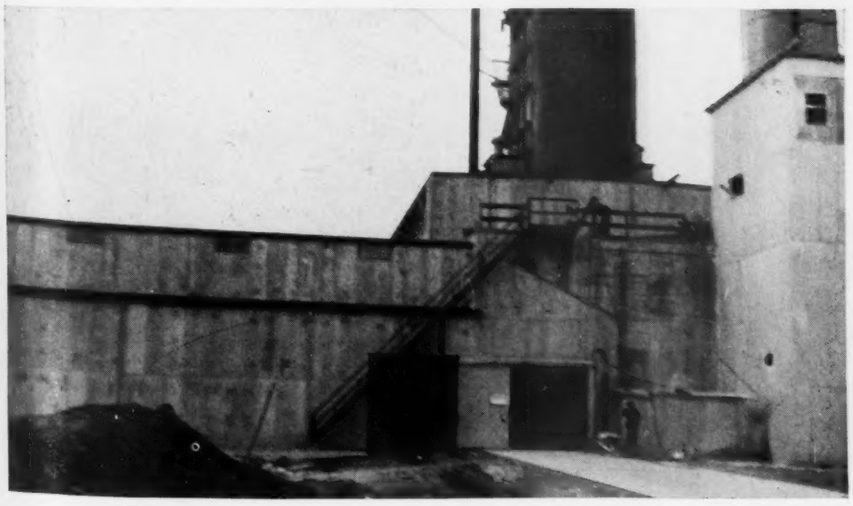
The entire plant is well laid out with an eye to appearance as well as utility. All the buildings are of concrete and steel construction with Armco iron siding. There is provision for doubling the capacity of the plant without disturbing the layout—foundations for two additional kilns are in place. There are two loading tracks running the entire length of the storage building upon which 12 cars can be placed. A spur connects the plant with the Maine Central railroad.



Lime pulverizer and its motor drive



Vibrating screens for screening pulverized lime



Exterior of the lime pulverizing plant. The screening plant shows at the right

The plant is now being operated as the lime department of the Lawrence Portland Cement Co. The officers and operating personnel comprise: Frank H. Smith, president; E. R. Ackerman, vice-president; M. S. Ackerman, second vice-president; C. A. Porter, third vice-president in charge of operations; J. S. Van Middleworth, secretary; E. F. Sheppard, treasurer; C. M. Loeser, assistant treasurer, and E. J. Davis, superintendent.

Modern Flotation Plant for Graphite

New Concentration Plant of the Southwestern Consolidated Graphite Co., Burnet, Texas

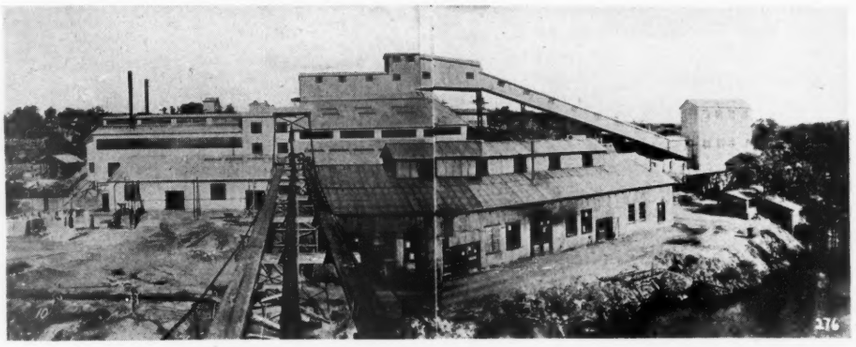
By H. B. Menardi
Southwestern Engineering Corp., Los Angeles, Calif.

THE demand for graphite to be used in the manufacture of dry batteries, electrodes, brushes and other commodities of a like nature is continually increasing. Specifications call for a carbon content varying from 78% to 85% and a screen analysis of 70% to 90% minus 200 mesh, thus the application of flotation for the production of such a product is a logical development.

The new plant of the Southwestern Consolidated Graphite Co., designed and erected by the Southwestern Engineering Corp. near Burnet, Texas, illustrates the compactness, economy and metallurgical efficiency of the modern flotation plant for the production of graphite.

Graphite has been produced from this deposit by various methods of treatment for the past 11 or 12 years. The first plant, located near the present site, was a small dry grinding mill which used air sizing and separation for production of flake graphite.

In 1917 and 1918 a larger plant was built, using electrostatic separation and air sizing in the production of a marketable graphite product. This plant was six stories high and required a large crew for operation. The crushing equipment included a 12-in. gyratory, 48-in. vertical Symons disk crusher and four sets of rolls. The crushed ore passed through a cylindrical dryer which, incidentally, cost $25 per day to operate, before going to the rolls. An elaborate screening system included trommels, Newago screens and bolting machines. Some 15 belt conveyors and 17 elevators were included in plant equipment. From all reports the operation of this plant must have been a real problem.



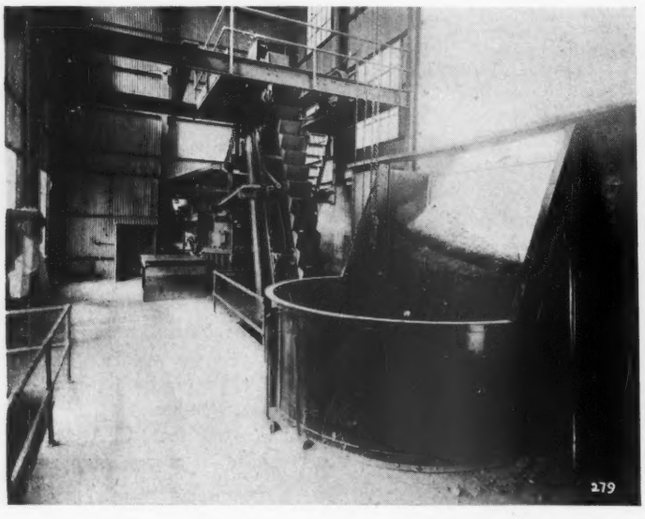
New plant of Southwestern Consolidated Graphite Co., Burnet, Texas. The power house shows at the right foreground and the tailing disposal line at the left

In 1921 flotation was first introduced for treatment of that portion of the feed which was too fine for successful separation in the electrostatic machines. During the past three years the use of flotation has been extended and its application simplified. E. Horton Jones, general superintendent, had a program all worked out for gradually replacing the old machinery with modern and up-to-date equipment without interrupting production. A disastrous fire, however, formed immediate new construction.

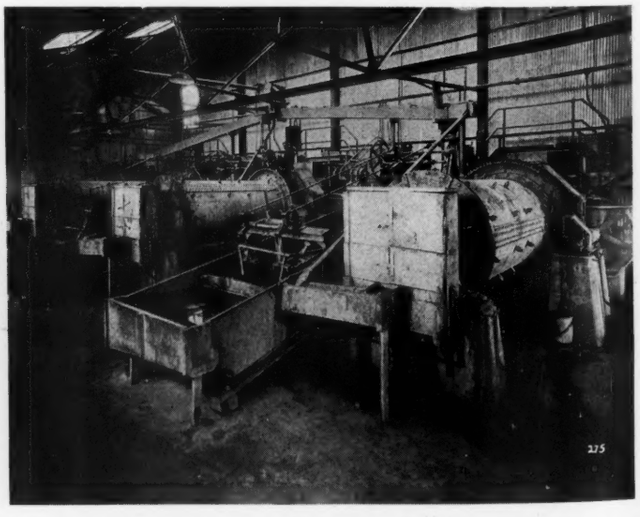
On March 28, 1927, during a severe electric storm and heavy rain the old mill caught fire, probably from an electrical short circuit, and was a total loss. Because of unfilled orders the Southwestern Consolidated Graphite Co. wished to resume production at the earliest possible moment, and the Southwestern Engineering Corp. was awarded the contracts for design and construction of a 500-ton plant.

New Plant Designed and Erected in Five Months

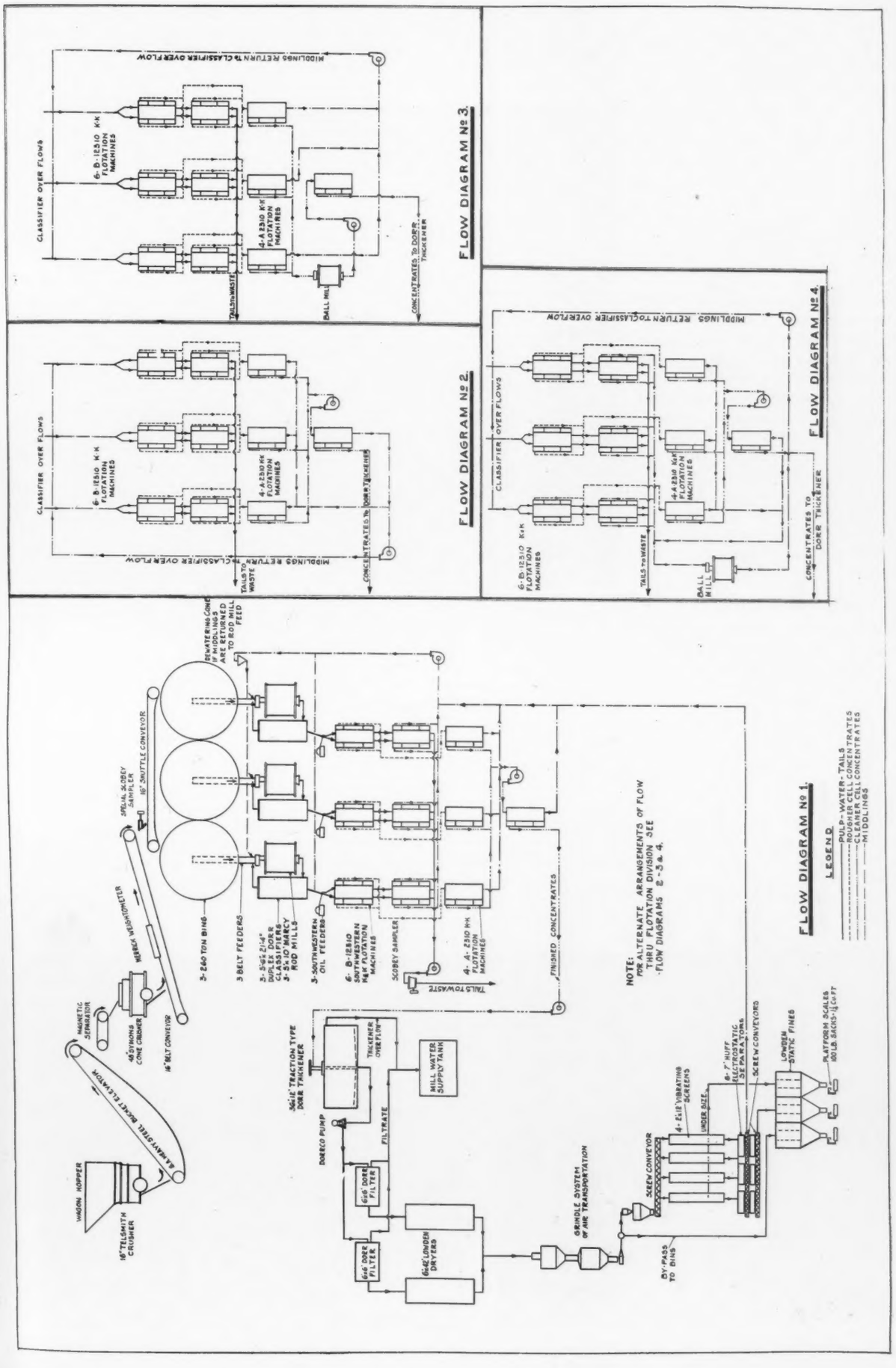
The new plant was designed and erected in five months after the contract was signed.



Crushing plant showing feed hopper over primary crusher, bucket elevator and cone crusher



Three 5x10-ft. rod mills grinding in closed circuit with three 5-ft. 6-in. by 21-ft. 4-in. classifiers



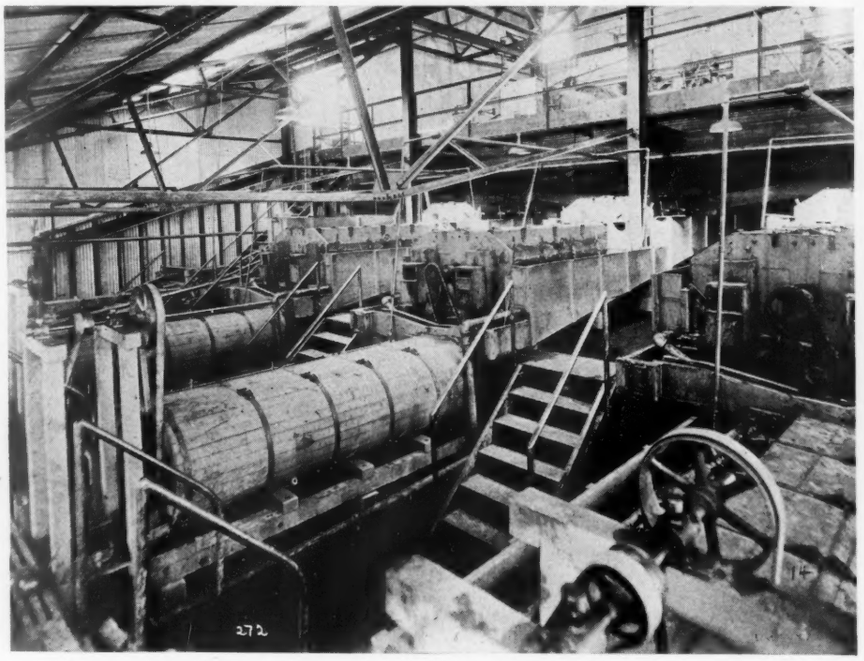
Flow diagrams of the new Burnet, Texas, graphite concentration plant of the Southwestern Consolidated Graphite Co.

Considering the size of the plant, the high class construction and the distance from metallurgical centers, this was a very creditable achievement. Accompanying views and flow diagrams show the type of construction and the class of equipment installed. The building is of steel and reinforced concrete, Class A, fireproof construction throughout. All power and lighting circuits are in conduits and up to standard specifications of the National Code. Adequate safeguards in compliance with generally accepted safety rules are maintained throughout.

The graphite deposit, 100 to 150 ft. wide and a mile long, occurs in a shear zone in schist. Ore is loaded from open pits with 1-yd. steam shovels and is transported to the mill in 5-ton motor trucks fitted with 4½-yd. side dump bodies. A very simple, rapid and effective method of dumping these trucks has been applied. At the dumping slide the outside of the roadway is raised 8 to 10 in. so that the roadway slopes toward the crusher hopper. As the loaded truck stops at the dumping point the load is dumped by releasing a latch from the driver's seat. As soon as the dumping is completed the truck pulls down the roadway, where a gradual reverse slope rights and latches the body.

Crushing and Grinding

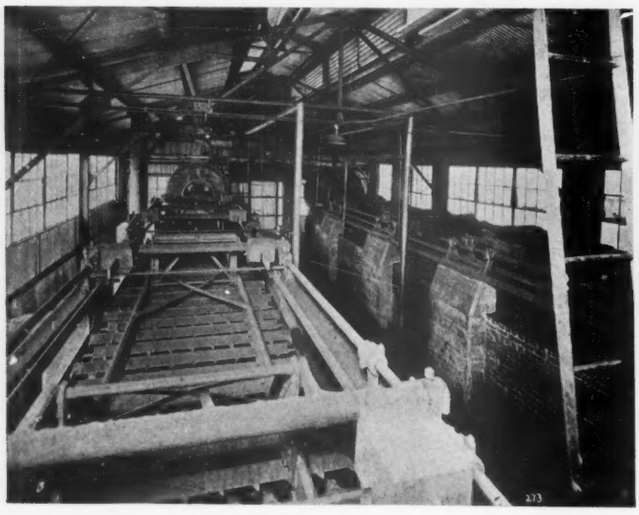
The crushing plant has a rated capacity of 50 tons per hour and operates 10 hours per day. Primary and secondary crushers are employed and the feed is reduced to minus ½ in. A No. 16-A Telsmith crusher receives the ore from the ore truck through a circular hopper placed directly over the crusher. This crusher reduces the feed to 3-in. From the primary crusher the feed is elevated to a magnetic separator for removal of tramp iron and is then spouted to a 4-ft. Symons cone crusher for reduction to minus ½ in. From the Symons crusher a 16-in. wide by 160-ft. long belt conveyor, equipped with Merrick weightometer and inclined at 18 deg., delivers the ore to a 16-in. hand-propelled shuttle conveyor, which in turn distributes the ore to three circular steel bins. These bins, 20 ft. in diameter by 20 ft. high, are carried on hexagonal-shaped concrete foundations. Special belt type Southwestern ore feeders draw from the center of each bin through tunnels in the foundations. From these feeders the ore passes to three 5x10-ft. Marcy rod mills, Penoles type, grinding in closed circuit with three 5 ft. 6 in. by 21 ft. 4 in. Dorr classifiers to minus 60 mesh. The pulp from the classifiers, at four to one dilution, flows to three units of K & K flotation machines, each unit consisting of two type B-2310 K & K roughers in series, followed by one type A-2310 K & K cleaner. Concentrate from the three primary cleaners is collected and pumped to one type A-2310 K & K machine for recleaning. After recleaning, the finished concentrate is pumped to a 35x12-ft. type S Dorr thickener. The underflow from this thickener is regulated by a Dorrco pump and passes to two 6x6-ft. filters and thence to two 6x42-ft. oil-fired Lowden dryers.



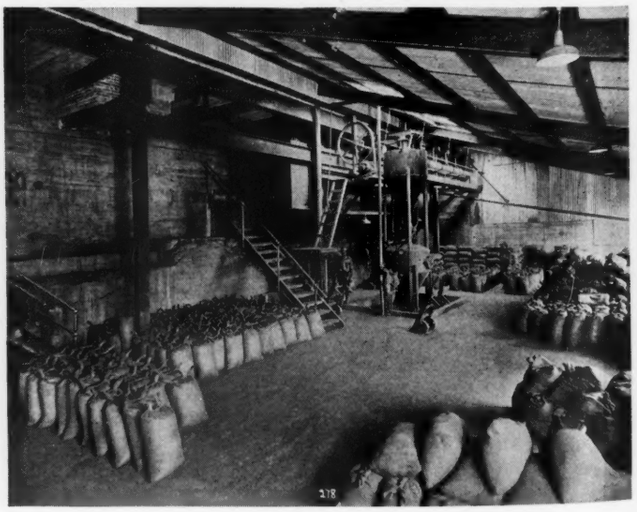
Flotation department showing the units of two double spitz roughers in series followed by one single spitz cleaner

Flotation Treatment

This treatment is indicated in flow diagram No. 1 and follows the original plan worked out by Mr. Jones. However, there are some fine points of operating economy which can only be worked out in actual operations, and there may be a variation in required specifications of the finished product, and for that reason a flexible arrangement has been provided in the flotation divi-



Rotary filters at far end and oil fired dryers in foreground



Sacking floor showing the pneumatic conveying installation

sion which will permit any one of the four variations in flotation treatment indicated in the four accompanying flow diagrams. The No. 1 flow diagram, as shown, will probably be followed during the major portion of the time, but each of the other arrangements have advantages under certain conditions. These alternative arrangements will be discussed in further detail later.

Screening

From the dryers the concentrate is carried by screw conveyors, to the receiving hopper of a Grindle pneumatic system, which elevates the dried product to a receiving tank at the top of the "static" department. When sufficiently high in fixed carbon content, the dried product will then pass directly to the final storage bins from which the product is weighed and sacked for shipment. Should further refining be necessary the product from the receiving tank is distributed to four Jones vibrating screens, fitted with 80-mesh screen cloth. The undersize from these screens passes to the "fines" storage bins for sacking, while the oversize is passed over electrostatic separators, which make a high grade product for sacking and a low grade rejection for regrinding and refloating.

In the old mill the "statics" raised the grade from 72% to 82%. "Statics" were installed in the new plant as a precautionary measure but, to date, it has not been necessary to use them. There may also be certain trade requirements at times which would demand specially prepared products obtainable only by means of the screens and "statics."

Power transmission is a serious problem in a graphite plant. In spite of all precautions the atmosphere is filled with finely divided graphite which seems to have a particular affinity for pulley faces and belts. Regardless of how generously a drive may have been designed, the belt will not stay in place without the continual application of belt dressing. This dressing in turn collects the graphite and the old mill was regularly shut down once a week for the purpose of removing great chunks of mixed belt dressing and graphite from pulleys all through the mill. In the new mill Allis-Chalmers Tex-rope or direct-connected motor drives are used throughout, except on the slow speed shafts in the filtering and drying departments where chain drives are installed. The Tex-rope drives are working out very satisfactorily.

Operation Data

In order to supplement and amplify the data upon which Mr. Jones worked out his flow sheet a number of small scale tests were made in the Southwestern Engineering Corp. laboratory. Results of several representative tests are shown in the following. A number of other ores have also been tested and it has been found, where the graphite is crystalline, that more or less parallel results are obtained with all graphite ores. Some ores require more regrinding and recleaning of the concentrate in order to obtain a given grade of finished concentrate but the same general laws, as typified in the test results presented, apply to most ores.

SINGLE STAGE ROUGHING AND CLEANING

Grinding—70.8% Minus 200-Mesh

Product	Weight Per cent	Assay F. C.	Recovery Per cent
Heads	100.0	7.8	100.0
Concentrate	5.8	78.0	60.7
Middling	3.1	9.2	2.9
Tailing	91.1	2.9	36.4

SINGLE STAGE ROUGHING—CONCENTRATE CLEANED TWICE

Grinding—69.2% Minus 200-Mesh

Product	Weight Per cent	Assay F. C.	Recovery Per cent
Heads	100.0	7.8	100.0
Concentrate	5.8	80.1	62.1
Middling No. 1	7.5	4.2	4.2
Middling No. 2	0.9	12.7	1.6
Tailing	85.8	2.8	32.1

SINGLE STAGE ROUGHING AND CLEANING—CONCENTRATE REGROUND AND RECLEANED

Grinding—1.7% Plus 60-Mesh; 40.7% Minus 200-Mesh

Product	Weight Per cent	Assay F. C.	Recovery Per cent
Heads	100.0	7.8	100.0
Concentrate	4.9	89.1	56.3
Middling	9.3	9.7	11.6
Tailing	85.8	2.9	32.1

With different ores the grade of concentrate and the recovery with any given treatment would differ considerably and the amount of regrinding and recleaning necessary to produce a given grade of concentrate would show wide variations but the same relative conditions apply to each ore. Consequently, the conclusions drawn from these tests are of general academic interest as applying to all graphite ores.

These conclusions are:

(1) With recovery held constant, grade of concentrate varies directly as fineness of grinding.

(2) With grade of concentrate constant, recovery varies directly as fineness of grinding.

(3) When the primary concentrate is reground and recleaned, equally good recoveries and grades can be produced with coarser grinding.

In a later test on 55 tons of ore from another property where specifications required 82% carbon content in the finished product, the problem resolved itself into a question of providing sufficient capacity for refloating the concentrate. Fed to a 4x3 ball mill at the rate of 2000 lb. per hour, the primary grinding was approximately 60% minus 200-mesh and with two-stage roughing and single-stage cleaning the concentrate averaged 60% carbon content. The screen analysis of the concentrate was 44% minus 200-mesh. Regrinding this concentrate in the same sized mill as was used for primary grinding and at the rate of only 300 lb. per hour as compared to the rate of 2000 lb. per hour for the primary grinding, the final grinding was 77% minus 200-mesh and with two-stage roughing and two-stage cleaning of the reground concentrate, 82% carbon content in the finished concentrate was made. With this particular ore, the same amount of power and equipment would be required for regrinding the concentrate as was required for the primary grinding.

While the treatment of graphite ore by flotation is a relatively simple process, each individual ore presents a problem in itself in the design of a well balanced plant, because of variations in grinding requirements, and consequently should be given a thorough and complete study based on sufficient experimental data.

Standard Method of Slaking in Testing Building Limes

THE results of recent experimental work at the British Building Research Station in connection with building limes is reported in a recent issue of the *Journal of the Society of Chemical Industry* (English). The investigation was brought about by the need for some standard method of slaking which would give reproducible results when carried out in different laboratories and by different operators. At the same time the desired method should give comparable results with those obtained, under reasonably favorable conditions, in the field.

Taking into consideration the marked behavior of many different limes and their essentially different slaking treatment, the investigators have developed and proposed a standard method of slaking building limes for the purposes of formal tests as given below in their summary:

"By 'isothermal' slaking in a large excess of water, and with rapid stirring, of the quicklime sample crushed to ⅛-in. size and less (*a*) at a temperature of 50 deg. C., (*b*) at boiling point, a reproducible product is obtained—the volume-yield of which can be taken as a fair and reliable guide to that quality of the lime, when the better of the two results (*a*) and (*b*) has been selected. In this way both "drowning" and "burning" are automatically avoided.

"In practice it is evident that the maximum volume-yield would be aimed at, so that it is assumed that the suggested method will give results comparable with those obtained, under favorable conditions, in the field.

"Although a fairly large range of typical British limes have been tested, and it is considered that the choice of two arbitrary temperatures will be sufficient to allow of a fair comparison being made between limes of these and similar types, it is realized that the maximum volume-yield for a particular lime may not be developed at exactly either one of these temperatures. There is, however, no reason for a manufacturer not being at liberty to specify the exact temperature at which his lime should be slaked for standard test purposes."

Iron Oxide vs. Alumina as a Fluxing Agent in the Manufacture of Portland Cement

Some Further Admixtures of High Iron Materials to Normal Raw Mixtures Employed in the Manufacture of Portland Cement—Experiments with Various Iron Containing Slags

By Alton J. Blank

Formerly Chief Chemist, La Tolteca Cia. de Cemento Portland, S. A., Tolteca, Now General Superintendent and Supervising Chemist, Compania de Cimento Portland Lando, Puebla, Puebla, Mexico

IN THE TWO PREVIOUS ARTICLES compiled by the writer on the subject, namely, "Iron Oxide vs. Alumina as a Fluxing Agent in the Manufacture of Portland Cement," which appeared in the May 26, 1928, issue of ROCK PRODUCTS, and "A Further Discussion of the Beneficial Results Obtained Through the Addition of Iron Ore to Normal Raw Mixtures Employed in Portland Cement Manufacture," which appeared in the July 7, 1928, issue of ROCK PRODUCTS, the beneficial results obtained through the addition of iron ore to the normal raw mixtures was thoroughly discussed.

A number of months ago the writer had occasion to sample an accumulated deposit of refuse slag from a blast furnace. This deposit of slag consisted of several thousands of metric tons that had been discharged from two furnaces, of which one was oil fired, the other being operated electrically. Representative samples of this slag on being analyzed, were found to have the following chemical compositions:

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4
Silica (SiO_2)	29.00%	26.20%	26.50%	26.16%
Alumina (Al_2O_3)	14.00%	17.00%	15.94%	18.12%
Iron oxide (Fe_2O_3)	52.02%	55.48%	56.30%	54.46%
Calcium oxide (CaO)	4.50%	0.42%	0.34%	0.54%
Magnesium oxide and sulphur	nil	nil	nil	nil

In view of the high iron oxide content found present in the slag the entire deposit was immediately contracted for as a raw material to be used in connection with the normal raw materials used by us in the manufacture of portland cement, as it had been found that iron ores high in iron oxide content was particularly beneficial when used in small percentages as an admixture to the normal raw mixtures, and it was to be supposed that any other material sufficiently high in iron oxide would be equally advantageous.

Admixture of High Iron Slag Tried

Accordingly, the admixtures of iron ore to the normal raw mixtures were temporarily discontinued and the admixture of small percentages of the high iron slag to the normal raw mixtures started.

The normal raw mixtures as heretofore used, when burned to clinker had the following chemical compositions:*

	Clinker Burned from Normal Raw Mixtures No. 1	No. 2	No. 3	No. 4
Silica (SiO_2)	20.82%	20.90%	20.60%	21.00%
Alumina (Al_2O_3)	7.63%	7.74%	7.57%	7.56%
Iron oxide (Fe_2O_3)	2.97%	2.90%	3.13%	2.94%
Calcium oxide (CaO)	64.66%	64.54%	64.53%	64.58%
Magnesium oxide (MgO)	2.18%	2.19%	2.18%	2.18%
Sulphur trioxide (SO_3)	0.48%	0.56%	0.52%	0.62%
Loss on ignition	0.30%	0.40%	0.40%	0.38%
Silica ratio—SiO_2/R_2O_3	1.96%	1.96%	1.92%	2.00%
Lime ratio—CaO/SiO_2 and R_2O_3	2.05%	2.04%	2.02%	2.05%
Silica-alumina ratio—SiO_2/Al_2O_3	2.72%	2.70%	2.72%	2.77%
Alumina-iron oxide ratio—Al_2O_3/Fe_2O_3	2.56%	2.66%	2.41%	2.57%

The ouput of this clinker from the kilns was considered as being normal. The fuel oil consumed in the kilns per barrel of clinker burned was 9.8 gal., or the equivalent of 1,434,132 B.t.u.

Results with the Use of Iron Ore

With the addition of small percentages of iron ore to the normal raw mixtures the chemical composition of the clinker burned during the latter months of the experiment, averaged as follows:

	Clinker Burned from Normal Raw Mixtures to Which Iron Ore Had Been Added No. 1	No. 2	No. 3	No. 4
Silica (SiO_2)	20.20%	19.20%	19.80%	19.90%
Alumina (Al_2O_3)	7.17%	7.41%	7.51%	7.16%
Iron oxide (Fe_2O_3)	4.33%	4.59%	4.49%	4.84%
Calcium oxide (CaO)	64.72%	64.84%	64.86%	64.78%
Magnesium oxide (MgO)	2.22%	2.17%	2.15%	2.20%
Sulphur trioxide (SO_3)	0.47%	0.58%	0.48%	0.44%
Ignition loss	0.32%	0.38%	0.36%	0.40%
Silica ratio—SiO_2/R_2O_3	1.75%	1.60%	1.65%	1.66%
Lime ratio—CaO/SiO_2 and R_2O_3	2.04%	2.07%	2.03%	2.03%
Silica-alumina ratio—SiO_2/Al_2O_3	2.81%	2.59%	2.63%	2.77%
Alumina-iron oxide ratio—Al_2O_3/Fe_2O_3	1.61%	1.63%	1.67%	1.47%

The output of this clinker from the kilns was found to average 12% greater than was received when normal clinker was being made from the normal raw mixture. The fuel oil consumed in the kilns per barrel of clinker burned was 12% less than when normal clinker was burned from the normal raw mixtures. When larger percentages of alumina in the raw mixtures were displaced with iron oxide these efficiencies were improved on accordingly.

With the addition of small percentages of the high iron slag to the normal raw mixtures the chemical composition of the clinker produced during the two-months' test to date is as shown in the table at the top of the next page.

The output of this clinker was found to average 12 to 15% greater from the kilns than was received when normal clinker was made from the normal raw mixtures. The fuel consumption in the kilns was from 12 to 15% less per barrel, when compared with the normal clinker.

A study of the results obtained during the two months to date that the high iron slag has been added to the normal raw mixtures show that the addition of this slag gives beneficial results more or less comparable

*ROCK PRODUCTS, May 26, 1928.

EFFECT OF ADDITIONS OF IRON-CONTAINING SLAG ON COMPOSITION OF PORTLAND CEMENT CLINKER

	No. 1	No. 2	No. 3	No. 4
Silica (SiO_2)	20.20%	20.34%	20.40%	20.00%
Alumina (Al_2O_3)	6.15%	6.20%	6.14%	6.28%
Iron oxide (Fe_2O_3)	5.35%	5.10%	5.16%	4.92%
Calcium oxide (CaO)	64.70%	64.68%	64.71%	64.86%
Magnesium oxide (MgO)	2.18%	2.20%	2.15%	2.21%
Sulphur trioxide (SO_3)	0.51%	0.45%	0.41%	0.54%
Ignition loss	0.32%	0.38%	0.30%	0.38%
Silica ratio—SiO_2/R_2O_3	1.75%	1.80%	1.80%	1.78%
Lime ratio—CaO/SiO_2 and R_2O_3	2.05%	2.04%	2.04%	2.07%
Silica-alumina ratio—SiO_2/Al_2O_3	3.28%	3.28%	3.32%	3.18%
Alumina-iron oxide ratio—Al_2O_3/Fe_2O_3	1.14%	1.21%	1.18%	1.27%

with those results obtained through the addition of the iron ore to the normal raw mixtures. This is especially true in that the output of the kiln is increased in proportion to the amount of alumina in the raw mixtures that is displaced with iron oxide. As this displacement of alumina with iron oxide increases the fuel oil required per barrel of clinker burned decreases in proportion. The quality of the cement has been bettered to the extent that out of around 5000 cement pats made on the hourly grind of cement during these experiments, not one has shown any sign of unsoundness. The tensile strength of the cement as determined by 1:3 sand mortar show increments in strengths at ages of 24 hr., 3 days and 7 days of 25% over those strengths obtained from the cement heretofore manufactured from normal raw mixtures, while the 28-day strength of the cement, the 3 months and the 6 months strengths show somewhat greater increments. Incidentally, the cement is somewhat easier ground.

With the increased iron content of the raw mixtures considerable trouble had been predicted in way of "rings" in the kilns, however, to date this trouble has not materialized. In fact, less trouble has been had with "ringing" up of the kilns.

Trouble with Lining Failures Eliminated

Where before considerable trouble was always had in keeping a coating of raw mixtures on the kiln-brick lining, with consequent failure of linings, and the occurrence of "hot spots," this trouble is no longer experienced with high iron content raw mixtures, and has resulted in a longer life from the kiln blocks, together with considerably less radiation of heat from the kiln shell.

Where before, from 1.48 to 1.53 tons of raw mix were required for the production of 1.00 ton of clinker, with the use of the high iron content raw mixtures the amount of raw mix required per ton of clinker burned now averages between 1.40 and 1.45 tons.

Conclusions would be that the displacement of alumina in the raw mixtures with iron oxide, whether through the addition of iron ore or high iron slag to these normal raw mixtures, results in certain economies being received in the manufacturing process.

The utilization of iron ore and high iron slags as fluxing agents in the burning of portland cement clinker may lead to the eventual use of other types of materials.

As an example, the mining and consequent smelting of metallic ores has resulted in there being deposits of slags, in both the United States and Mexico, that run into the thousands of tons. The use of these slags, insofar as the writer has knowledge of, is confined to that of aggregate for construction purposes, and ballast for railroads. In either case the amount of these slags used is small comparatively.

A number of months ago a series of slags representative of various deposits were submitted to the laboratory for analysis, the results of which are as follows:

Samples of Slags from Smelters

	No. 1 Lead Vitreous	No. 2 Lead Stony	No. 3 Copper Slag
Silica (SiO_2)	40.00%	32.40%	38.10%
Alumina (Al_2O_3)	16.32%	14.28%	14.33%
Iron oxide (Fe_2O_3)	16.48%	24.72%	20.07%
Calcium oxide (CaO)	25.00%	25.20%	25.38%
Magnesium oxide (MgO)	1.08%	0.72%	0.94%
Sulphur trioxide (SO_3)	nil	nil	nil

Samples of the pulverized slag were found to fuse at temperatures ranging between 800 and 900 deg. C.

Samples of the three slags were then used by adding small percentages of them to normal portland cement raw mixtures, and these samples were forwarded to a commercial testing laboratory for fusion point determinations.

The normal raw mixture began clinkering between the temperature of 2400 to 2450 deg. F.

The normal raw mix to which a small percentage of lead vitreous slag had been added began clinkering between the temperatures of 2350 and 2400 deg. F.

The normal raw mixture to which a small percentage of least stoney slag had been added began clinkering between the temperature of 2300 and 2350 deg. F.

The normal raw mixture to which small percentages of copper slag has been added began clinkering at the same temperatures as that required by the normal raw mixture.

From the above laboratory results it would appear as possible that these slags might possess certain advantages should they be used as a raw material in the manufacture of portland cement.

At a later date experiments on a larger scale may be attempted.

South Carolina Highway Officials Blame Cement for Failure

IN ORDER that the company might work with the state highway commission in effecting an adjustment with the manufacturers, the ban against the Carolina Portland Cement Co. of Charleston, S. C., imposed in connection with failure of sections of the Travelers Rest highway, Greenville county, was formally suspended recently by the South Carolina highway commission. The commission, holding its regular monthly meeting, acted on the recommendations of its materials committee.

In connection with lifting of the ban on cement handled by the Carolina company, it was pointed out that the firm is a dealer or broker and not a cement manufacturer and that its president had agreed to pay the legal costs of pressing the highway commission's claims against the manufacturers of the cement. Action taken, it was said, already had caused the president of the cement manufacturing company to come to Columbia to confer with the highway department officials. —*Columbia* (S. C.) *State.*

Calavera Rock Co. Building $75,000 Plant

THE Calavera Rock Co., of Carlsbad, Calif., has been formed to develop a rock quarry in the extinct volcano crater of Calavera Mountain, four miles east of Carlsbad. The company, which is backed by Los Angeles interests, is now erecting a $75,000 crushing plant on the property. Two crushers are being installed, and a high steel viaduct is to be constructed to convey the rock from the quarry and the primary crusher, which are located high up the mountain, down to the final reduction plant 200 ft. below. A modern macadam highway is to be built from the plant to the Vista-Escondido paved highway over which a fleet of trucks will be operated transporting the product.

Lee Walker and T. F. Collins are superintending the construction and will be in charge of the plant when it begins operating. While Mr. Collins is the practical rock man of years' experience, Mr. Walker's experience includes mining and engineering.

When opened the quarry and its equipment will have a capacity for 500 tons a day. The plant will be ready for operation about September 15, according to Mr. Walker.

Hints and Helps for Superintendents

Handling Air Drill Steel Through Well Drill Holes

W. L. HOME
Mining Engineer, Pine Plains, N. Y.

ON a large scale rock excavation job two inclined raises were driven from a tunnel level 250 ft. below the surface of the ground up to the surface. Upon getting the raises part way to the top the problem of ventilation and of getting the drill steel to the backs of the raises became important factors. The same problem may be met some time in the operation of limestone or gypsum mines.

Although ventilating fans were operated almost all the time, three shifts were working and much time was lost due to bad air. Letting drill steel down the shaft, hauling to the manways and hoisting it up in the stopes was a mean, slow and costly job. Also from the tops of the manways to the backs of the stopes the transportation of the steel was difficult.

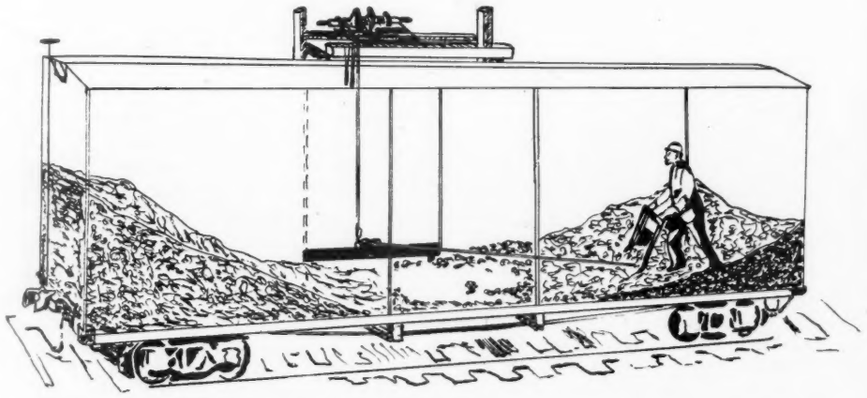
To assist ventilation, a series of large-diameter well-drill holes were put down so as to hole through always as near the backs of the raise or stope as possible. It was then found convenient to let down all of the sharp steel through these well-drill holes and to hoist up the dull steel. This made a minimum amount of handling of the steel and always landed it close to where it was going to be used. The hoisting outfit consisted of a portable air hoist that could be moved from hole to hole, a tripod made of three pipes for a head frame and a carrier for the steel made of a piece of 8-in. pipe with a bail and a bottom provided.

Unloading Crushed Gypsum Box Cars at Cement Plants

By RAYMOND B. LADOO
U. S. Gypsum Co., Chicago, Ill.

MANY cement companies prefer to have their crushed gypsum rock, used as cement retarder, shipped in box cars rather than open-top gondolas. This is done to keep the rock dry and is especially desirable when dried rock, crushed to ¼ in., or rock containing fines, is used. Finely pulverized gypsum has a tendency to absorb water and pack or cake together, making it difficult to handle and feed.

The chief objection to box car shipments is the difficulty and expense of unloading. While open top cars may be quickly and cheaply unloaded by dumping or by the use of a crane and grab bucket, box cars are usually unloaded by hand shovel and wheelbarrow, a slow and fairly expensive method. Recently a number of cement companies have become interested in finding some form of mechanical or semi-mechanical device to solve the problem of box car unloading. The device to be described here is not new, but it does not seem to be generally known to cement companies. At least one cement company has installed this equipment, another is planning to install it, and many companies in other industries are using it for unloading a considerable variety of crushed and ground materials.



Diagramatic sketch of a box car with a power shovel in use, showing the location of the winch over the door, and the pulley arrangement in the door

This device, known as a power shovel, is a standard piece of equipment made and sold by several machinery companies in this country. It consists essentially of a mechanically driven winch and automatic clutch with a hand-manipulated slip scraper. The general appearance of the device is indicated in the illustrations.

To operate it a man draws the scraper back into the car to the point where the material is to be removed. When the slack in the rope is taken up the automatic clutch takes hold, the scraper picks up its load and is drawn to the door of the car, guided by the operator. At the unloading point the tilting forward of the scraper slackens the rope, which disengages the clutch, and the load is dumped. The cycle is repeated until all the material in one end of the car is removed. The lead of the rope is then transferred to the snatch block on the other side of the car and the remainder of the car is unloaded. The design and construction of the digging edge of the scraper can be modified to suit the material to be handled.

The mechanism is inexpensive, easy to install, cheap and simple to operate, and takes very little power. If a separate drive motor

Showing the use of a power shovel for unloading various types of materials from box cars, at a considerable saving in time

is needed, one of about 5 hp. is used, but that provides a surplus of power. Usually it is possible to take the power from the tail motion of a belt conveyor or bucket elevator or from a nearby line shaft. It is easily capable of unloading crushed rock up to 1½ in. in diameter.

The cost of unloading material with the power shovel is very low compared to hand unloading and is probably lower than by the use of pneumatic conveyors. At one plant, where a fine crushed material is received in bulk in box cars holding about 30 tons, the cost of unloading with the shovel is less than $1.50 per car. It takes one man (45c per hour) about 2½ hours to unload an average car. Before the shovel was used two men were needed per car working with wheelbarrows, and the cost was $8 to $10 per car. Thus the cost of unloading was not only greatly reduced, but, due to the rapidity of unloading, "bunching of shipments" is less bothersome. Cars now can be quickly unloaded and released before demurrage starts.

Of course this system can be used to advantage only where there is a bin or elevator or conveyor close to the car-unloading point, so that the material dumped from the scraper can be taken care of mechanically. In some plants where wheelbarrow unloading is used, men must wheel the material a considerable distance after leaving the cars. In such plants, if much material is handled, it would pay to put in the necessary conveyor or elevator, as well as the power shovel. The equipment would cost only a few hundred dollars and, at a saving of only $5 per car, it would pay for itself in a short time.

Scraper for Cleaning Belt Conveyors

SOME difficulty was experienced by the Old Dominion Co. in getting a satisfactory scraper for the waste rock conveyor from the mine until the one shown in the accompanying sketch was tried. As this is somewhat different from any I have seen described as being in use elsewhere, it may prove of interest.

The waste conveyor is made up of odd pieces of belt, some new and some from belt discarded from other conveyors. Cleaning was therefore a little more difficult than if the belt had been of uniform section. The piece of belting used for the scraper is made adjustable by using slotted holes. The size of the counterweight was determined by trial, the weight being varied until satisfactory operation was obtained.—*E. H. Oneal in the Engineering and Mining Journal.*

One Use for an Old Belt Conveyor Idler

ALTHOUGH the device shown in the illustration is not a new idea, the use of an old conveyor idler in the construction is a novelty. This cleaning device for revolving screens, which taps the side of the screen each time it rolls over a bolt head or nut, was made by using the wooden idler of an old conveyor with the bearings attached. Over the wood idler was driven a 4-in. iron pipe to furnish a wearing surface. The bearings of the roller are attached to the usual framework, which in this case is of steel angles and bars, and this is pivoted on a part of the screen framework, as shown in the illustration. This arrangement is in use at the sand plant of the Peters Sand and Gravel Co. at Burlington, Wis.

An old conveyor idler used on a revolving screen to keep the openings clear

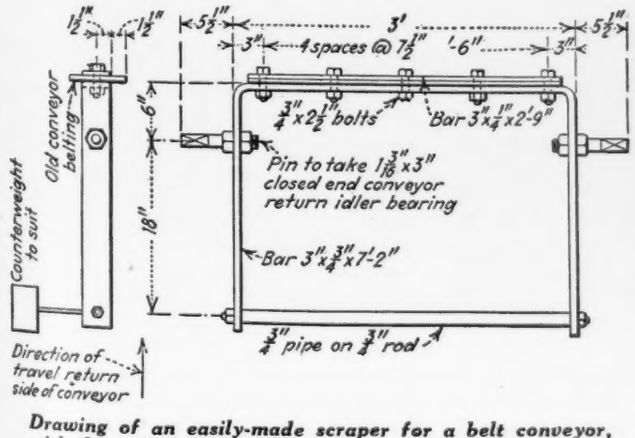
Convenient Method of Hanging Chain Blocks

AT the new "Velo" plant of the Missouri Portland Cement Co., which is now under construction at Prospect Hill, St. Louis, Mo., the conveyors handling the clinkers to and from the clinker storage are known as "Cylcup" conveyors, manufactured by F. L. Smidth and Co. These conveyors are similar to the usual clinker conveyor. In elevating the clinker, the conveyors pass over head pulleys at the top of the storage silos, the driving mechanism also being located there.

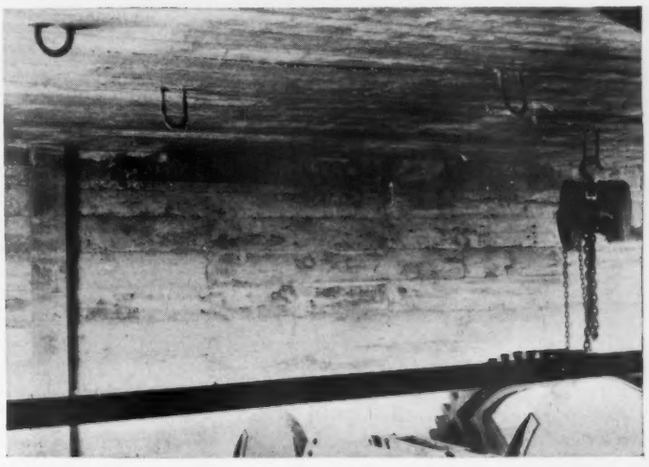
The silos and elevator shafts for the conveyors, as well as the roof of the structure, are of reinforced concrete. The gears, shafting, bucket line, etc., are all of heavy construction and to handle this equipment both during construction and later for possible repairs, heavy "U" bolts have been embedded in the concrete ceiling and are used to hang chain blocks. There are five or six of these "U" bolts spotted at convenient points above the various pieces of equipment. Where the load is heavy the strain can be divided among two or more of these bolts.

At the time the picture was taken two sets of chain blocks were being used, one 1½-ton block and the other a 3-ton, the larger block not showing in the picture.

This is a little "kink" that could well be used more often, especially on new construction work, but even in some of the older plants, instead of rigging up most any kind of a wreck to hold the chain blocks, permanent "U" bolts could be installed in about the time it takes to hunt up blocking, chains and rope slings. In old plants of frame construction supporting timbers have to be used.



Drawing of an easily-made scraper for a belt conveyor, with the end view at the left, and plant view to the right



U-bolts embedded in concrete ceiling to handle heavy machinery during installation and for repairs

The plant of Golding Sons Co., at Trenton, N. J., with the bins for the crude feldspar in the building to the left

Feldspar Grinding Mill Uses Modern Methods to Obtain a Uniform Product

Plant of Golding Sons Co. at Trenton, N. J., Is Fitted with Most Up-to-Date Mechanical Devices

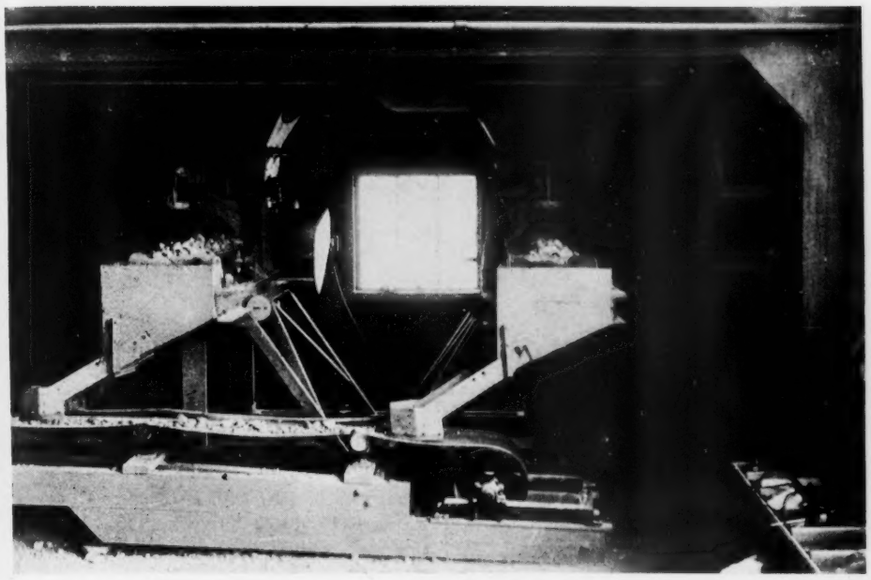
ONE of the largest producers of feldspar in this country, the Golding Sons Company, of Trenton, N. J., has recently completed its new grinding and finishing mill in Trenton. This plant is the most modern to be found in this line of the rock products industry, and embodies many unusual features, one of the most notable being the use of poidometers for accurately proportioning the various kinds of feldspars into any required mix. The plant itself is entirely of fireproof construction, being built of concrete and structural steel, with siding of corrugated iron.

The Trenton plant grinds material shipped from the company's various producing points, such as its new plant near Spruce Pine, N. C., or from Georgetown, Maine. The crude material is brought to the plant by rail and unloaded to the primary crusher, which is a large jaw-type machine placed at one end of the row of storage bins for the crude material. This crusher breaks the feldspar to 2-in. size and delivers the discharge to the boot of an inclined bucket elevator which takes it to the top of the crude feldspar storage bins and deposits it upon a belt conveyor which runs over the tops of the bins from the elevator to the farthest bin in the row. This belt is fitted with a special device for discharging the rock which can be placed at various points along its length to empty the belt into any one of the bins below, as desired.

Crude Feldspar Storage

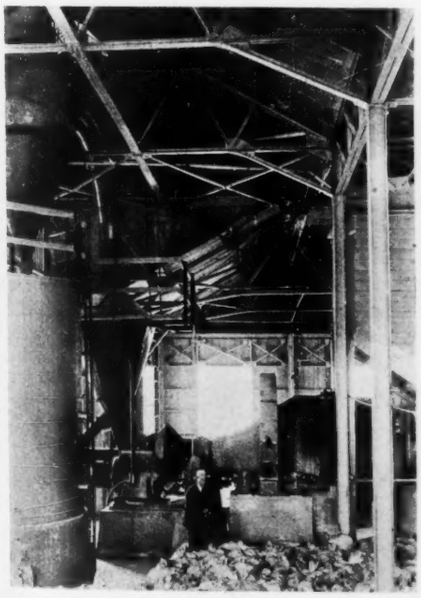
The crude feldspar storage bins are of reinforced-concrete construction, set on concrete corner posts, with room underneath for the reclaiming conveyor and the poidometers. There are four of these bins at present, and arrangements were made when the plant was constructed for the addition of two more bins of the same type to be built when the business of the company warrants the enlargement. The present ones have a capacity of 300 tons each. Although these bins all receive unscreened material from the same crusher, and hence are all filled with the same size crude feldspar, it is necessary to keep the material separate because of the differences in chemical and physical properties of rock from the various different producing points. Hence one bin is used for Maine feldspar, one for North Carolina spar, etc. The bins are provided with gates below for discharging the stored material.

A horizontal belt conveyor runs under all four of the crude feldspar storage bins and delivers the material from the bins to the secondary crusher. The most interesting feature of this new plant is the use of two poidometers to deliver exact amounts of feldspar from the bins to the conveyor. These are Schaffer electrically-operated, traveling poidometers, so arranged that they can deliver material from any two bins at the same time, or they can both deliver from the same bin at the same time. This means that the poidometers can be set to supply any required proportions of two kinds of feldspar when it is desired to produce a blending of the material, and the resulting flow to the secondary crusher will be exactly uniform. On the other hand, should it be necessary to supply all of one type of material, the poidometers are set to deliver the exact required amount to belt conveyor, which carries it in a uniform flow to the crusher. This use of absolute grading of feldspar is important because more and more the users of the material, mostly producers of ceramic products, are demanding exact proportioning of the material shipped to them. Their work is carried out with such exactness as to require



The two automatic weighers below the crude feldspar storage bins, delivering material to the conveyor to the secondary crusher

the use of feldspars having uniform chemical analyses to insure the results being the same when different feldspar shipments are used. The use of poidometers for the work of blending the material is undoubtedly the surest and simplest way to obtain the required results. To insure exactness at the Trenton plant, the two poidometers are



The fireproof construction of the plant is well shown in this interior view

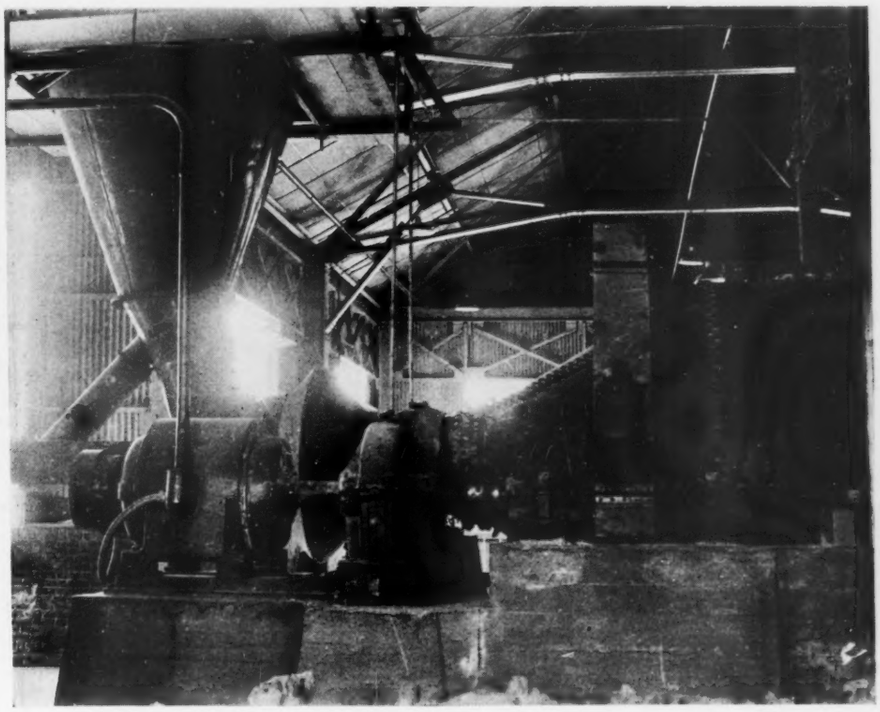
fitted with electric cut-outs so that if either one of the machines should stop operating for any reason whatsoever, the other machine will automatically stop also. This, of course, prevents any possibility of an incorrect blending of the material.

The belt conveyor under the storage bins delivers the crude feldspar to the secondary crusher which reduces it to pieces ½-in. in size and smaller. An elevator then takes the material to the first dryer, through which it passes and is then again elevated, and delivered to a vertical gravity dryer. Following this second dryer is a Dings magnetic separator which removes all particles of metallic iron or steel from the crushed feldspar, delivering a product free from this undesirable foreign matter. After passing over the magnetic separator there is no opportunity for the crushed feldspar to come in contact with loose iron or receive any from some outside source, so the resulting product is free of any possibility of containing such iron or steel in any form whatsoever.

The discharge from the magnetic separator drops to a wooden feed bin which in turn delivers the material to an 8-ft. Hardinge conical pebble mill, fitted with a Hardinge reverse-current air classifier. When grinding the feldspar to a fineness of 200-mesh, this mill has a capacity of approxi-

The pebble mill with its feed bin to the right and the intermediate storage bin to the left

mately two tons per hour. From this mill the fine-ground material is delivered to an intermediate storage bin, the air classifier returning the oversize to the mill. Through the use of this grinding and classifying



The conical pebble mill, equipped with reverse-current air classifier, showing the motor and drive to the left

equipment dust is practically eliminated from the plant.

The intermediate bin to which the pebble mill discharges is placed at this point to hold the material until it can be sampled and tests made to determine if the product, which may be either a blend or a straight run of one kind of material, is exactly as was desired. This is just another check in the careful process of getting out an exact and uniform product for the benefit of the consumers.

Power for operating the crushers, belts and the Hardinge mill is all supplied by electric motors receiving current through a transformer station outside of the plant.

From the intermediate storage bin, the finished feldspar is delivered to one of the six large finished storage bins. These bins are of reinforced concrete construction like the crude feldspar bins at the other end of the plant, and are circular in shape and each is supported on six reinforced-concrete posts. There is sufficient headroom under the bins for a driveway for trucks for loading the products. A siding provides opportunity to load directly to railroad cars for shipment in that manner also.

Operates Other Plants

The Golding company has developed considerable business along lines allied to the feldspar trade as is necessary as it operates a china, clay and pottery plant at Hockessen, Del. At the Trenton plant, the company is already making an enlargement by installing other grinding units which will be suitable for grinding flint for ceramic work, and also for grinding Cornwall stone, an emerald green stone resembling malachite, which was named for Cornwall, Eng., where it was originally discovered.

Beside the new plant at Trenton, and the pottery plant at Hockessen, the company has just completed another new plant near Spruce Pine, N. C., and is also operating its old plants at East Liverpool, Ohio, and Erwin, Tenn. It also has connections at Georgetown, Maine, from where it receives its Maine feldspar. The new plant at Spruce Pine is conveniently located at the source of supply. This plant is similar to the Trenton plant in the carefulness with which the feldspar is finished, but differs in a number of places in the flow of the material through the plant. There are the same crude storage bins, from which the feldspar passes to the crushers and then to the Hardinge mill before it passes over the magnetic separator. Leaving the separator, the material is screened and the fines are delivered to the cars directly for shipment, or are passed through air separators. The materials retained on the screens, as well as the tailings from the air separators, are returned to the Hardinge mill for regrinding. The finished material may either go to storage bins or pass directly to the railroad cars. This plant has a good capacity, having ground an average of more than 100 tons of feldspar per day during June, which was the first full month of its operation.

Interior the Trenton plant, showing the pebble mill, feed bin (center) and dryer

A Market for Silica Materials

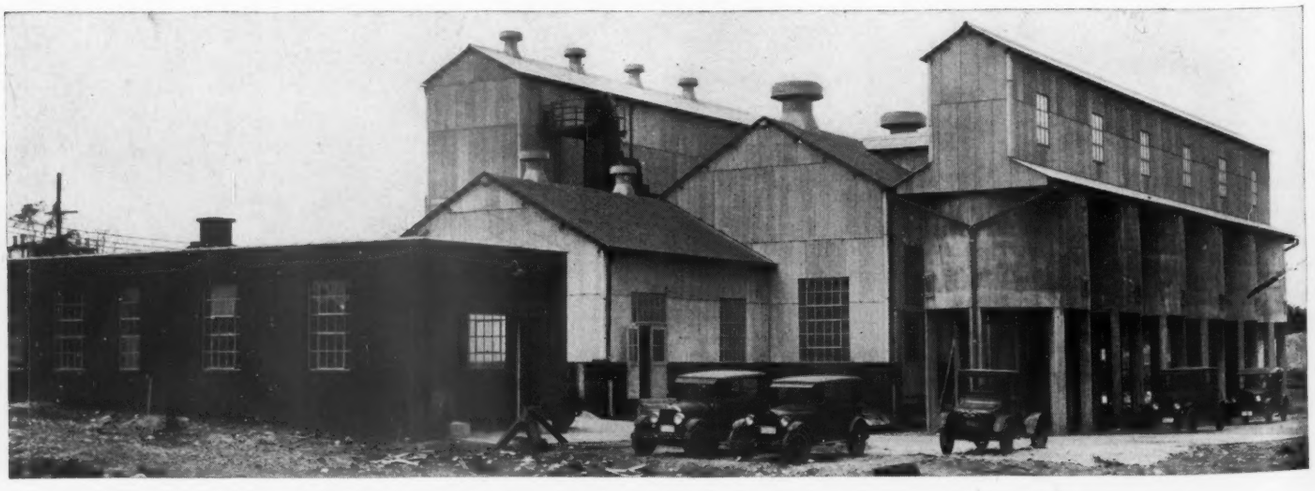
THE AETNA RUBBER CO., 811 East 79th street, Cleveland, Ohio, has asked ROCK PRODUCTS to put it in touch with producers and grinders of silica or silicate minerals passing 100-mesh or finer. The mineral must be free from any of the metallic elements. Mr. Kalman is the chemist of the Aetna Rubber Co., who wants this information and samples of the material.

Kentucky to Have Two More Rock Asphalt Operations?

WHILE representatives of the $2,000,000 cement plant were in Frankfort recently to hear delegations from the counties bidding for the plant, announcement was made by C. Frank Dunn, secretary of the Kentucky Progress Commission, that two asphalt companies are planning to locate their plants in this state.

The announcement followed an informal talk by Gov. Flem D. Sampson to the representatives of the 31 cities who were here to urge their claims for the plant, in which he urged the co-operation of the entire state to bring other manufacturing plants into Kentucky.

Declaring that the Kentucky Progress Commission "has the biggest and most important task ever assigned to anybody in Kentucky," the governor said: "I believe the 12 members of the commission are the outstanding potential factors in the upbuilding of the commonwealth."—*Winchester* (Ky.) *Sun.*



The Golding plant with the six round bins for finished feldspar at the right above the roadway for loading trucks

Editorial Comment

Use of X-Ray Analyses

We hope no reader really interested in the study of the constitution of portland cement, lime, gypsum or other rock product, missed the article in our August 18 issue on "Autographs of Nature." We have never seen a simpler explanation of the use of X-ray for mineral analysis and identification. At last we are able to *see* positively the difference between calcite and aragonite, two forms of calcium carbonate (limestone), with recognizable difference in properties, but indistinguishable by chemical analysis. The field opened for the use of X-ray in these rock products industries ought to appeal to the imaginations of every live-wire producer.

Ballast Under Pavements

About fifteen years ago there was an editorial in the leading engineering journal of its day on ballasting pavement foundations, pointing out that railway engineers had learned very early in the art of railway track construction that a satisfactory track, no matter how well constructed, could not be maintained on a mud foundation. Yet highway engineers seem never to have profited by this railway experience, and only in the past few years has much or any attention been paid to properly preparing the sub-bases of pavements to insure that the pavement itself prove satisfactory.

Even today, when it is well known, or should be, that mud and clay subsoils are the causes of most pavement failures, it is very unusual for highway engineers to prepare the foundation for a $40,000- or $50,000-a-mile-pavement, as a railway engineer would prepare the roadbed for a track costing approximately the same. This is the more odd because it is a matter of common observation that concrete pavements on sand and gravel subsoils almost invariably give better service and have longer lives than do similar pavements on clay soils.

The primary purpose of railway ballast is drainage. It prevents water and frost—two destructive elements—from reaching the track structure proper. It also serves to distribute the wheel loads on the track foundation and preserve the track alignment, both vertically and horizontally. Is the problem of maintaining and supporting a highway pavement essentially different? Water and frost, if anything, are even more destructive because there is less opportunity for their escape.

In the case of portland cement concrete pavements a properly ballasted subgrade probably has an important influence on its original strength. Le Chatelier, in his researches on portland cement, when the industry was in its infancy, proved that briquettes allowed to set and harden on blotting paper or other absorbent material had appreciably greater tensile strength than those hardened in the usual way. The reason was that the excess water not required for the chemical reaction was drained off but all required for the reaction was held by capillarity and particles of the cement in the briquettes were thus brought closer together, forming a stronger bond and a denser mortar or concrete. Various different ways have since been invented such as vibrating the wet concrete, working it with floats and screeds, etc., to accomplish identically the same purpose. But the preparation of the subgrade so that the result would be automatic has been quite generally overlooked.

Stone screenings and sand have been recommended and have been used to a small extent on highway subgrades. Unquestionably these help, but the applications have been too limited in extent and too shallow in depth to really serve the equivalent of ballast as in a railway track. Only recently, we understand, has Los Angeles County, California, completed a concrete pavement which can be said to be constructed as a railway roadbed and track is constructed.

The sub-base or ballast for the pavement consists of 5 or 6 in. of crushed stone (obviously none too much if we are to learn anything from railway experience). The stone used was approximately three parts of No. 2 and one part No. 3 crushed macadam rock. Pea gravel was first used to fill the voids in the crushed stone base; subsequently crusher screenings were found more satisfactory. The stone base was rolled to a thickness of 5 in. On this "ballasted" roadbed a concrete pavement 8 in. thick at the center was laid in the usual way.

Of course, only time and experience will tell the whole story. But it is too bad that the experiment was not tried in a part of the country where frost is an important factor. In our opinion all properly built pavements will be similarly constructed in the years to come, or the engineering experience in a hundred years of railway construction are valueless. There is no reason, of course, why a gravel base similarly constructed will not serve the same purpose, as gravel serves the purpose of railway ballast.

Highway engineers and public officials will doubtless object to spending more money for pavements, or as some may see it, of adding the cost of a macadam or gravel road to the cost of the pavement; but if it doubles the life of the pavement and saves maintenance costs it is obviously a good investment. We hope more highway engineers will see the light soon.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.	8-27-28	44	46	75c qu. July 14
Alpha P. C. pfd.[2]	8-27-28	116	.....	
Amer. Aggregate 6's, bonds	8-30-28	102½	103½	
Am. L. & S. 1st 7's[32]	2-24-28	101¾	102½	
American Silica Corp. 6½'s	8-30-28	96	100	
Arundel Corp. new com.	8-28-28	40	40¼	50c qu. July 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	7-18-28	103	109	
Atlas P. C. com.	8-27-28	46	.....	50c qu. Sept. 1
Atlas P. C. pfd.	8-27-28	47	49	66⅔c qu. July 2
Beaver P. C. 1st 7's[30]	8-23-28	98	100	
Bessemer L. & C. Class A[4]	8-24-28	34	34½	75c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	8-24-28	100	100¾	
Boston S. & G. com.[16]	8-23-28	76	80	$1 qu. July 2
Boston S. & G. 7% pfd.[16]	8-23-28	83	85	1¾% qu. July 2
Boston S. & G. 1st pfd.[16]	8-23-28	92	96	2% qu. July 2
Canada Cem. com.[43]	8-24-28	.....	29	
Canada Cement pfd.[43]	8-24-28	.....	99	1.62½c qu. Sept. 30
Canada Cement 5½'s[43]	8-24-28	100¾	.....	
Canada Cr. St. Corp. 1st 6½'s	8-24-28	96	99	
Canada Gyp. & Alabastine	8-27-28	62	63¼	
Certainteed Prod. com.	8-27-28	43½	44	$1 qu. July 1
Certainteed Prod. pfd.	8-27-28	90⅜	96½	
Cleveland Stone new st'k	8-28-28	50	60	50c qu. Sept. 1 & 25c ex.
Consol. Cement 1st 6½'s, A[42]	8-30-28	94	.....	
Consol. Cement 6½ notes[24]	8-30-28	92	96	
Consol. Cement pfd.[41]	8-30-28	40	60	
Consol. S. & G. com. (Canada)	8-13-28	12½	12½	
Consumers Rock & Gravel, 1st Mtg. 6's, 1948	8-23-28	97	99	
Coosa P. C. 1st 6's[32]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	8-11-28	90	.....	
Coplay Cem. Mfg. com.[40]	8-11-28	12½	.....	
Coplay Cem. Mfg. pfd.[40]	8-11-28	72½	.....	
Dewey P. C. 6's[30]*	8-30-28	98	.....	
Dolese & Shepard†	8-30-28	145	148	$2 qu. Oct. 1 $1 ex. Oct. 1
Edison P. C. com.[19]	8-25-28	No market		
Edison P. C. pfd.[19]	8-25-28	No market		
Edison P. C. bonds[19]	8-25-28	75	.....	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.[25]	8-28-28	25	30	
Giant P. C. pfd.[25]	8-28-28	33	36	3½% June 15
Ideal Cement, new com.	8-28-28	70	72	$1 qu. July 1
Ideal Cement 5's, 1943	8-25-28	101	103	
Indiana Limestone 6's	8-27-28	91½	92½	
International Cem. com.	8-29-28	63	63½	$1 qu. Sept. 28
International Cem. bonds 5's	8-29-28	96	96½	Semi-ann. int. payable June 15
Iron City S. & G. bonds 6's[46]	8-27-28	97½	98½	
Kelley Is. L. & T. new st'k	8-28-28	50	54	62½c qu. July 2
Ky. Cons. Stone Co. com.[48]	8-23-28	100	102	
Ky. Cons. Stone no par com.[48]	8-23-28	13	15	
Ky. Cons. Stone 6½'s[48]	8-23-28	97	100	
Ky. Cons. St. Trustee Certif.[45] (1 sh. 7% cum. pfd. & 1 sh. com. stock)	8-23-28	100	102	1.75 Aug. 1
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[2]	8-27-28	104	108	2% qu.
Lehigh P. C.[2]	8-28-28	45	48	62½c Aug. 1
Lehigh P. C. pfd.[2]	8-28-28	110	111	1¾% qu. Oct. 1
Lyman-Richey 1st 6's, 1932[13]	8-27-28	98½	100	
Lyman-Richey 1st 6's, 1935[13]	8-27-28	98	100	
Marblehead Lime 1st 7's[14]	8-24-28	100	.....	
Marbleh'd Lime 5½'s, notes[14]	8-24-28	99	.....	
Mich. L. & C. com.[19]	8-27-28	35	.....	
Missouri P. C.	8-28-28	46	46½	50c qu. Aug. 1
Monolith P. C. com.[9]	8-25-28	15	.....	8% ann. Jan. 2
Monolith P. C. pfd.[9]	8-25-28	9¼	.....	
Monolith P. C. units[9]	8-23-28	34¾	36¼	
National Cement 1st 7's[35]	8-25-28	99	101	
National Gypsum A com.[35]	8-30-28	20	25	
National Gypsum pfd.[35]	8-30-28	60	65	1¾% qu. Apr. 1
Nazareth Cem. com.	8-27-28	31	33	75c qu. Apr. 1
Nazareth Cem. pfd.	8-27-28	102	105	
Newaygo P. C.[1]	12-30-27	115	.....	
Newaygo P. C. 1st 6½'s[32]	2-11-28	120	.....	
New Eng. Lime pfd., A[45]	8-11-28	94	97	
New Eng. Lime pfd., B[23]	8-13-28	97	99	
New Eng. Lime com.[23]	8-13-28	32	35	
New Eng. Lime 1st 6's[14]	8-24-28	98	100	
N. Y. Trap Rock 1st 6's	8-29-28	101	101	
North Amer. Cem. 1st 6½'s	8-29-28	76	76	
North Amer. Cem. com.[19]	8-25-28	5	10	
North Amer. Cem. 7% pfd.[19]	8-25-28	25	30	1.75 qu. Aug. 1
North Amer. Cem. units[19]	8-25-28	30	40	
North Shore Mat. 1st 5's[15]	8-30-28	99	100½	
Northwestern States P. C.[37]	8-25-28	194	205	
Pac. Coast Cem. 6's. A	8-24-28	96	98	
Pacific P. C. new com.[5]	8-25-28	.....	20	
Pacific P. C. pfd.	8-25-28	75	78	$1.62½ qu. Apr. 5
Pacific P. C. notes[5]	3-22-28	99	.....	3% s.-a. Oct. 15
Pacific P. C. 6's	8-24-28	98	100½	
Peerless Egyp'n P. C. com.[21]	8-27-28	1½	2½	
Peerless Egyp'n P. C. pfd.[21]	8-27-28	75	85	1¾% qu. July 1
Penn-Dixie Cem. 1st 6's[29]	8-30-28	94¾	95¼	
Penn-Dixie Cem. pfd.[28]	8-30-28	75	80⅛	$1.75 qu. Sept. 15
Penn-Dixie Cem. com.	8-30-28	14½	15½	50c qu. July 1
Petoskey P. C.	8-28-28	9¼	10	1½% qu.
Pittsfield L. & S. bonds[31]	10- 8-27	.....	100	
Pittsfield L. & S. com.[31]	10- 8-27	.....	25	
Riverside P. C. 1st pfd.	8-23-28	97	100	1.50 Aug. 1
Riverside P. C., A	8-23-28	20	21	31¼c cum. part. Aug. 1
Rockland-Rockport Lime 1st pfd.[10]	5-17-28	.....	100	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[10]	5-17-28	.....	60	3% s.-a. Feb. 1
Rockland-Rockport Lime com.[10]	.....	No market		1½% qu. Nov. 2
Sandusky Cem.	8-28-28	205	.....	$2 qu. July 2
Santa Cruz P. C. bonds	8-25-28	105¾	.....	6% annual
Santa Cruz P. C. com.	8-24-28	90	.....	$1 qu. Apr. 1
Schumacher Wallboard com.	8-25-28	17	20	50c May 15
Schumacher Wallboard pfd.	8-25-28	24	25½	
Southwestern P. C. units[44]	8-23-28	270	.....	
Superior P. C., A[20]	8-23-28	45½	46	27½c mo. Aug. 1
Superior P. C., B[20]	8-23-28	32	33	
Trinity P. C. units[37]	8-25-28	155	165	
Trinity P. C. com.[37]	8-25-28	52	.....	
U. S. Gypsum com.†	8-30-28	60½	61⅞	2% qu. Sept. 30
U. S. Gypsum, rts.	8-29-28	17½	18½	
U. S. Gypsum pfd.	8-30-28	125½	.....	1¾% qu. Sept. 30
Universal G. & L. com.[3]	8-30-28	.....	1	
Universal G. & L. pfd.[3]	8-30-28	.....	12	1½% Feb. 15
Universal G. & L., V.T.C.	8-30-28	No market		
Universal G. & L. 1st 6's[3]	8-30-28	55	60	
Upper Hudson Stone 1st 6's, 1951[32]	12-28-27	92	.....	
Vulcanite P. C. 1st 7½'s[32]	12- 5-27	105	109	
Chas. Warner com.	8-27-28	33	36	50c qu. July 10 & 25c ex.
Chas. Warner pfd.	8-27-28	109	.....	1¾% qu. July 26
Whitehall Cem. Mfg. com.[26]	8-27-28	150	.....	
Whitehall Cem. Mfg. pfd.[26]	8-27-28	95	.....	
Wisconsin L. & C. 1st 6's[15]	8-30-28	99½	101	
Wolverine P. C. com.	8-29-28	5½	6½	15c qu. Aug. 15
Yosemite P. C., A com.[20]	8-23-28	5	6	

†10% stock dividend, July 10. U. S. Gypsum common holders of record July 14 have the right to purchase new common at $20 a share to the extent of 50% of holdings. Right expires Oct. 1. Payments of 25% are due: Oct. 1, 1928; Feb. 1, June 1, and Oct. 1, 1929. *Called for redemption Oct. 1.

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, Chicago, Ill. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [45]Tifft Bros., Pittsfield, Mass. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	.....
Benedict Stone Corp. 1st 7's 1934[8]	.....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	.....	£1⅛
River Feldspar & Mill'g Co., 50 com., 50 pfd.[3]	$200 for the lot	.....
Rockport Granite Co., 1st 6's, 1934	90	.....
Simbroco Stone Co.[9]	12	12
Simbroco Stone Co.,[9] 40 sh. pfd., par $50; 40 sh. com., par $10 (40 units)	$2 per unit	.....
Simbroco Stone Co.,[10] 10 sh. pfd., par $50	$10.25 per sh.	.....
Southern Phosphate Co.[6]	1¼	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Wabash Portland Cement Co.[2]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....

[1]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [2]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [3]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [4]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [5]Neidecker and Co., London, England. [6]Auction sale of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [7]Price at auction May 2, 1928, by Wise, Hobbs & Arnold, Boston. [8]Price at auction, June 6, 1928, R. L. Day & Co., Boston, Mass.

Analysis of Peerless Egyptian Cement Co.

LIVINGSTONE, CROUSE AND CO., Detroit and Grand Rapids, Mich., have issued an analysis of the financial status of the Peerless Egyptian Cement Co., from which the following extracts are taken:

The plants of the Peerless Egyptian Cement Co., located in Detroit, Port Huron, Union City and Fenton, Mich., are all ideally situated for the distribution of cement to a prosperous and growing territory. The market for a product depends firstly on the number of people that can be reached at a competitive price and, secondly, upon the purchasing power of the inhabitants of the area. Purchasing power depends largely on the capacity to produce. Manufacturing, lumbering, agriculture, mining, shipping and fishing constitute the principal sources of income in Michigan. The latest available statistics reveal that the value of products produced in Michigan in 1927 was $4,373,186,136, of which amount the city of Detroit contributed $1,599,340,383, or approximately 32%.

The combined annual production capacity of the company's plants is in excess of 3,000,000 bbl. of portland cement. The company produces cement at an exceedingly low cost due to the quality and accessibility of raw materials and efficiency of manufacturing facilities.

Assets—The balance sheet reflects the exceptionally strong working capital position with current assets of $2,136,085.65 current liabilities of $848,713.83 and net working capital of $1,287,371.82. Net tangible assets applicable to this issue of preferred stock amount to $6,715,482.07, equivalent to more than $1119 per share.

Earnings—The consolidated net earnings of the company for five years ending December 31, 1927, are as indicated below:

Year ending	Net earnings after interest, depreciation and federal taxes available for preferred dividends
December 31, 1923	$245,281
December 31, 1924	252,286
December 31, 1925	276,676
December 31, 1926	155,489
December 31, 1927	243,872

Based on the above figures, the average earnings for the past five years, available for preferred dividends, amounted to $234,800, equivalent to 5.5 times the maximum preferred dividend requirement of $42,000. This, we believe, convincingly demonstrates the earning capacity of the company.

Stock purchase warrants—Stock purchase warrants accompany each share of preferred stock in which a potential value is apparent. These warrants entitle the holder to purchase from the company 15 shares of no par common stock at $20 per unit of three shares up to July 1, 1928; at $22.50 per unit of three shares July 1, 1928, to July 1, 1930; at $25 per unit of three shares each from July 1, 1930, to July 1, 1931.

Directors—The board of directors of the Peerless Egyptian Cement Co. includes: L. A. Beeghly, chairman of the board, president, Bessemer Securities Corp.; Wm. M. Hatch, president; S. R. Livingstone, secretary, Livingstone, Crouse and Co., investment bankers, Detroit; C. C. Peck, president, United States Savings Bank, Port Huron, Mich.; Charles M. Schmutz, vice-president, vice-president, Bessemer Securities Corp.; A. J. Hennings, Peabody, Houghteling and Co., investment bankers, Chicago; Royal T. McKenna, representing Fisher and Co., Washington, D. C.; E. A. Peck, Peabody, Houghteling and Co., investment bankers, Chicago.

General—The Peerless Egyptian Cement Co. was organized under the laws of the state of Michigan in 1927 to acquire the business and properties of the Peerless Portland Cement Co. and the New Egyptian Portland Cement Co., thereby placing the operations of the two companies under one management and effecting considerable savings in production and sales costs.

Because of the excellent location of the plants with respect to raw materials and market for its products, the stability of earnings which the company has enjoyed, the unexcelled management and the net tangible assets available for preferred stock we recommend the purchase of Peerless Egyptian Cement Co. 7% cumulate preferred stock, with stock purchase warrants attached, at par to yield 7%, believing it to be one of the most attractive preferred stock investments obtainable in the market today.

CURRENT ASSETS AS OF DECEMBER 31, 1927

Cash in banks and on hand		$ 60,343.98
Cash in hands of trustee to meet principal and interest payments on first mortgage 6½% bonds		158,928.70
Customers' accounts and notes receivable—less reserve for cash discount, cartage, bad debts, etc.		578,076.06
Sundry accounts receivable		17,228.04
Inventories:		
Finished cement	$455,091.93	
Clinker	249,434.29	
Raw materials and supplies	616,982.65	1,321,508.87
Total current assets		$2,136,085.65
Prepaid insurance, taxes, interest, etc.		45,982.82
Balance due from officers, employes and stockholders		24,710.38
Advances to be applied on royalties and sack purchases		42,234.00
Advances to customers for construction purposes		11,505.38
Deposits on contracts		6,182.50
Investments		27,750.00
Property, plant and equipment		7,568,914.13
Deferred charges		581,596.00
Treasury stock		7,744.75
Total		$10,452,705.61

CURRENT LIABILITIES

Notes payable—banks		$ 52,500.00
Notes payable—trade		136,775.53
Accounts payable—trade		365,033.56
Customers' credit balances, etc.		20,553.77
Accrued liabilities		111,850.97
First mortgage 6½% serial gold bonds, due January 2, 1928		97,000.00
5½% general and refunding gold bonds, maturing during 1928		20,000.00
Purchase money obligations		4,500.00
Provision for federal income tax		40,500.00
Total current liabilities		$ 848,713.83
First mortgage 6½% serial gold bonds ($97 000 included in current liabilities—December 31, 1927)		1,808,500.00
5½% general and refunding gold bonds (less $20,000 included in current liability)		406,000.00
Land contract payable		4,196.89
Capital Stock:		
Preferred stock		600,000.00
Common stock, 1,194,270 shares, ascribed value $5	$5,971,350.00	
Surplus	813,944.89	6,785,294.89
Total		$10,452,705.61

Bessemer to Increase Capital

THE EXPANSION ACTIVITIES of the Beeghly interests of Youngstown, Ohio, in the cement business were reflected in a call of the Bessemer Securities Co. for a special meeting August 27 to increase its capital to provide additional funds.

Bessemer Securities is controlled by L. A. Beeghly and associates. Mr. Beeghly is head of the Standard Slag Co. and through the Securities company controls the Bessemer Limestone and Cement Co., the Federal Portland Cement Co. at Buffalo, and the Peerless-Egyptian Cement Co. of Detroit and Port Huron, Mich., with an aggregate annual capacity of about 6,000,000 bbl.

The capital stock of Bessemer Securities will be increased from 120,000 to 200,000 shares and most of the additional authorization sold to provide funds to take over control of Peerless Egyptian.

Mr. Beeghly and his associates at Buffalo are linked with the Bethlehem Steel Co. and it is expected they will join hands shortly with an independent steel maker in the Chicago district to establish a cement plant there.—*Wall Street News* (New York City).

Pennsylvania-Dixie Cement Omits Common Dividend

DIRECTORS of Pennsylvania-Dixie Cement Corp. voted to omit a common dividend of 50c a share usually declared at this time and which would have been payable October 1, next.

The regular quarterly dividend of 1¾% on the preferred was declared, however.

In connection with the passing of the common dividend, Chairman John A. Miller and President Blaine S. Smith of the Pennsylvania-Dixie Cement Corp. stated that the volume of business is good and that July earnings were nearly three times the preferred dividend requirements for the month and that net earnings for the seven months exceeded the preferred dividend requirements for the same period. They said further that prospects are that the preferred dividend for the year will be earned by a substantial margin. On the other hand, they pointed out that the much lower prices for cement obtained in the southern territory and along the Atlantic seaboard this year as compared with last have resulted in a substantial decrease in the corporation's earnings and that the board of directors therefore deemed it advisable not to declare a dividend on the common stock at the present time in order to conserve the corporation's resources.

BALANCE SHEET OF PENNSYLVANIA-DIXIE CEMENT CORP. JUNE 30, 1928

ASSETS

	1928	1927
Cash	$965,791	$2,077,416
Pyramid Portland Cement Co.	‡1,305,507	.....
Notes and accounts receivable	1,879,046	1,682,411
Inventories	2,951,486	3,085,242
Fixed assets	*25,311,576	26,504,640
Miscellaneous investments	118,600	119,500
Insurance fund	35,000	30,000
Deferred charges	93,855	67,813
Total	$32,660,861	$33,567,022

LIABILITIES

	1928	1927
Accounts payable	$676,816	$227,271
Dividends payable	.....	320,000
Accrued wages, interest, taxes, etc.	429,974	364,958
Reserve for federal taxes	261,177	531,116
Miscellaneous reserves	42,022	59,839
First mortgage sinking fund 6's	11,941,960	12,443,000
7% cumulative preferred stock	13,588,800	13,000,000
Common stock, no par value	†4,000,000	4,000,000
Surplus	1,720,112	2,620,838
Total	$32,660,861	$33,567,022

*After deducting depreciation. †Represented by 400.000 shares of no par value. ‡Entire capital stock and properties.

Fall Accidents

Why the Operators and Safety Men Must Watch This Period of the Year

By Jack Dempster
Canada Cement Co., Ltd., Port Colborne, Ontario

RATHER a peculiar statement—someone said to us a few days ago, "We made a very fine showing in our campaign to reduce accidents during June and July. What we must do now is wage a campaign against 'fall accidents'."

Why "fall accidents?" It is very true that figures available for our industry show a decided increase in the number of accidents in the latter months of each year, so it appears that we have been inclined to shrug our shoulders and say, "Fall accidents!" Evidently we have become of the opinion that we can put on a safety campaign in the middle of summer, rush it through to a glorious "conclusion," and let it go at that. Sheer fallacy! That is not "Accident Prevention."

We cement men have a he-man's job. We throttle and groom ponderous and intricate machinery that reduces to impalpable dust the great rocks of nature. Under our control are the fierce calcining fires of giant kilns. The conveying of many thousands of tons of dazzling, white-hot clinker and the operation of running belts and whirling gears is part of our every-day life throughout the year. It is true that between us and these sources of potential danger every protective mechanism that safety engineering can devise has been placed; it is true that employers and safety committees are constantly on the lookout and warning us, but these safeguards are present all the year round.

If there is any more uncomfortable season of the year in which to manufacture portland cement than a scorching hot summer day, we have yet to hear of it, and when a facetious nincompoop comes along, when you are wringing wet with perspiration and plastered with "raw-mix" and says, "Cheer up, brother; it isn't the heat, it's the humidity that bothers," you feel like causing an "accident" right then and there. In spite of all this, however, we have just demonstrated that by buckling down to business we can overcome these seasonal obstacles and establish an entirely new record in the reduction of accidents. When 50,000 cement men, scattered in 165 plants through the continent, can operate for the month of June with an accident experience of 99.89% safe, it makes one take notice.

We possibly have a small advantage over some of our less fortunate industries, in so far that we started earlier in the game to realize that industrial safety is a matter of 90% accident and 10% safeguards, and that 98% of accidents can be avoided. We were taught to realize that accidents were not to be considered with the same attitude that "Topsy" took towards the origin of her existence, when she declared that she "just growed." We know an accident never "just happens" and we know that it is the direct effect of a cause or of many causes. We have learned to analyze our accidents to find these underlying causes and we have profited greatly by our experience.

JACK DEMPSTER believes there is no good reason for the large increase of cement mill accidents experienced every fall. We are told that some of the worst and also the most needless accidents have occurred during this period. No mill man can read what Mr. Dempster has written without agreeing with him and at the same time developing a desire to carry this advanced attitude toward accidents into his own mill.—Editor.

Are the Fall Months More Hazardous?

But what takes place during the latter months of the year—the "fall"? Do we make portland cement in a different manner? No! Do we use different machinery? No! Do our hazards increase. "Yes," some of you will say, "due to inclement weather conditions and extra work performed incidental to cleaning up after the heavy year's shipping." That's just the whole blame trouble. We are content to pass the buck, blame it on the weather, rain, mud, slippery footing, uncertain health, effect of bad weather on disposition of men, etc., etc., ad infinitum. Rather a gross admission of defeat, isn't it!

Say, Mr. Safety Man! When you saw that the oiler had to reach over an open pair of bevel gears in order to reach a grease cup, what did you do? Did you just hope that he wouldn't get caught? Not by a big sight! You guarded the gears and protected the oiler. We know beforehand that "fall months" will bring changeable weather. Isn't there anything that can be done to prevent it from interfering with the safety of our operations and men? Cannot we use the same methods of common sense and education to guard from the effects of bad weather that we used to guard the open gears?

When you learned that the miller would have to step over an open meat-grinder—a screw-conveyor—in order to get to another portion of the mill, did you tell him not to slip and let it go at that? You did not! You put a grating and a cover on the conveyor and prevented it from grinding flesh. You made it to convey cement material only and you put a safe walkway over it. You found a way to remove the danger of accident from a known hazard. When we are cleaning up in the mills, the stock and packing houses, in the "fall," when the stock of cement has run low, many screw-conveyors are brought into the open that have been covered when the bins were full; walls have to be cleaned down, the cement has to be scraped to the conveyors, slides are liable to and do occur, and dust falls from a height. Yet, forewarned is forearmed, and we can have our gratings, if they are not already in position, our safety belts and ropes, and our goggles. The whole thing is that if we *want* to prevent accidents and try hard enough, we are going to have success; but if we are haphazard about it, well—

Men are subject to "colds" and sickness in the summer just as much as in the autumn and it is easier to get "grouchy" in hot weather, so the excuse that the hazards are multiplied because of seasonal effects on the human constitution is very shallow. Personally, we fear that the "fall increase" is due to nothing more nor less than a letting down of the safety bars after a summer's campaign. Let us be frank, we who are striving to make this life a little better, and admit that *there is no necessity for a periodical increase in accidents in the cement industry every "fall"!*

The Portland Cement Association is urging that the campaign that produced such good results during June and July be carried on during the coming months. Of the total working force of its member plants, 99.89% operated in June without an accident, and an outstanding feature is that June and July were the hottest months of the year. Cement men know what that means. Of course we put forth special efforts to eliminate hazards, but the investment paid, in lives, limbs and finances.

If fall conditions create greater obstacles, let us cope with them in like measure. May, June and July have certainly established a record for accident prevention work in the portland cement industry and drawn the eyes of the industrial world to us. Why? Be-

cause *"Somebody said that it could be done and we went ahead and did it!"* A member plant of the association, starting a few years ago with a very poor accident record, has run up the extraordinary total of 580 consecutive days without a lost-time accident and is still going strong. A sister plant, in the same company, in the short space of four years, went from the inability to operate for a single month free from accidents, to the operation of 521 consecutive days, and both these plants proudly display the association's trophy. Here is the point that I wish to

Jack Dempster

bring out: These and the other 12 or so plants that have operated for a year or more free from accidents passed through the period of the "fall" months and it made no difference to them. They had their breakdowns; they knew what it meant to have courses of the kiln lining let go to inclement weather, and they had their quarry and stockhouse troubles—they knew that they had certain obstacles to overcome and their organization took every precaution against accident. They are no different from the others of the 165 plants in the association, in operation or requirements, but they certainly proved the mettle of their safety committees.

Now, then, of the organizations enrolled for the June campaign, are there any which will not say that, even though they were not successful in operating without an accident through the month, they did not benefit in many ways because of these efforts, and that their men were no better off? We do not think there are, for we know of the spirit that such a humanitarian campaign breeds. So! If you are one of those who have to report an increase in accident figures for the last part of each year, why not dig into these figures and analyze them? Why not endeavor to ascertain if there is any definite connection between your accidents and that particular season of the year? If you find contributory causes, cannot a remedy be found for them? There can, because we are men enough to pick up the glove that has been thrown at our feet.

Records such as have been mentioned above can and will be duplicated over and over again, for the books of these plants have shown the wisdom of their investment in safety. In one group of plants, members of the same company, their books showed, in the period between 1920 and 1927, as proved by actual statements, a 75% decrease in accidents, 87.4% decrease in cost of accidents, and 86% increase in production per man-hour of labor. Do you see the connection between these figures? Yet this period covered the "fall months" as well. It only shows what can be done and that the latter portion of the year can be made to show no startling increase over the June accident figures; if your safety organization meets steel with steel.

In conclusion, I will emphatically state an often-repeated fact — the only manner in which a campaign to reduce industrial accidents for any period, fall or any other time, can be carried on in order to insure success, is by a human appeal to the finer feelings of the ranks. By a systematic policy of education, which embraces loyalty to employers and consideration for the fellow-worker, will be instilled that long-looked-for spirit of cooperation. That spirit will automatically provide the mechanical safeguards and will create a feeling, to use the words of W. H. Weitknecht, "not of the small boy who in fear and trembling faces an angry parent because of the infraction of a stern rule, but that of the manly boy who hates like hell to face the father whom he loves."

Lehigh Portland Helps Indiana Obtain Another State Park

A GIFT to the state of Indiana of 288 acres of rolling timber land in Lawrence county by the Lehigh Portland Cement Co., Allentown, Penn., for a state park, has been announced by Richard Lieber, state conservation director. The land, which will go toward the formation of the state's seventh park, was obtained through the outright gift of E. M. Young of Allentown, president of the Lehigh company. The tract adjoins land which the last legislature authorized converted into a state park, bringing the total to 500 acres. Those in charge of the plans seek to acquire 1000 acres for the reservation.

Largest Limestone Cargo Ever Moved on Lakes

CARRYING THE LARGEST CARGO ever transported on the Great Lakes, the steamer *Carl D. Bradley,* largest and fastest boat on the lakes, nosed into the Buffington, Ind., harbor of the Universal Portland Cement Co. on July 27 with 16,033 gross tons of limestone. "This is the largest cargo of any kind ever carried on the Great Lakes," said William J. McLean, captain. Immediately upon its arrived the *Bradley,* which is a self-unloading vessel, began with its own automatic electrical machinery to discharge its cargo at the rate of a ton a second. The limestone came from the Michigan Limestone and Chemical Co.'s quarry at Calcite, Mich., the largest quarry in the world, and will be used in the manufacture of cement. Loading and receiving this unusual cargo were made possible by the depth of the Calcite and Buffington harbors, which are among the deepest on the Great Lakes.

John T. Dyer Quarry Co. Inaugurates a Safety Competition

THAT the portland cement industry has no monopoly on safety work is shown by the accompanying illustration of a safety plaque which has been inaugurated by one of the large eastern quarry companies. The plaque is to be awarded to the plant of the John T. Dyer Quarry Co. of Norristown, Penn., which throughout the year maintains

Safety trophy of the John T. Dyer Quarry Co., Norristown, Penn.

the best safety record, according to F. T. Gucker, president of the company. The Dyer company operates three quarries near Birdsboro, Penn., all of which produce a similar type of trap rock. The award is to be made annually, and the name of the winning quarry for each year is to be engraved on the shield.

This certainly is a step in the right direction, since there is nothing like competition to produce results in safety work. The idea is well worth while and ROCK PRODUCTS is glad to turn the suggestion over to its readers in the hope that similar competitions may be started by other companies. If you have started one, please let us know about it!

Safety Progress Shown by Diagrams

Cement Mills Continue to Make Real Progress in Accident Prevention

THE accompanying diagrams, measuring recent progress in the reduction of accidents in the cement industry, indicate that recent months have been entirely without precedent so far as improvement in this particular field is concerned.

Diagram A, on which appears the monthly trend of lost time accidents since January, 1925, shows that with the single exception of June, 1926, there has been no month during the past three and a half years which has not shown a reduction of accidents from the record of all previous corresponding months. Successful results of the annual no-accident drive in June, 1928, are shown, giving that month the lowest accident record in the history of the cement industry. The quarter ending on June 30 had 10% fewer accidents than any previous quarter and the half year ending on the same date showed figures 15% under those of any previous semi-annual period.

Diagram B is of interest as indicating the very great reductions in accidents in the month of July following the annual June no-accident campaigns. It will be noticed that there were 276 fewer accidents reported in July, 1928, than in July, 1924—a reduction to 19% of the 1924 volume in four years.

June and July Accidents

The curves plotted on Diagram C show the rate at which accidents accumulate day by day, from the first to the last day of each month shown. These curves trace the relationship between June and July accidents for the last three years. All of the curves show a remarkably uniform rate of accidents throughout the month, with the exception of July, 1928, although a straight line drawn between the terminals of this curve would pass through or quite near to a great many of the points. It will be noticed that the curve for the month of June, 1926, when the usual June no-accident campaign was omitted, was very similar to, but a little above, the curve for July, 1926, July usually being regarded as having slightly less potential hazard.

In June, 1927, there was a very spirited campaign against accidents which reduced personal injury mishaps to about 30% of the volume suffered during the previous June. The effort during June, 1927, was so intense that while July, 1927, had only 55% as many accidents as July, 1926, the July, 1927, volume was nearly double that of June, 1927. The campaign of June, 1928, brought down accidents 17% below the record of the preceding June and was followed during July by a modest effort to "beat the June record." While this object was not achieved, the showing was sufficient to bring the June and July curves for 1928 into closer proximity, June being 35% under July.

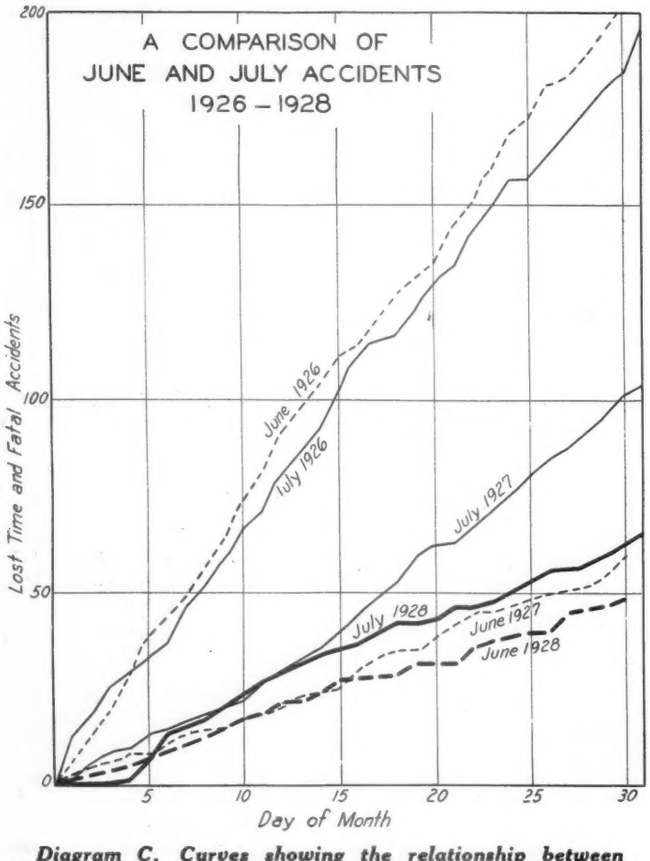


Diagram C. Curves showing the relationship between accidents during June and July, 1926-1928

Accident Frequency Standing

The accident frequency in cement plants during the first half of 1928 averaged 3.75 accidents per plant reporting, there being 562 lost time and fatal accidents. If the present reductions are maintained until the end of the year, the annual accident rate for 1928 will be 7.5 per plant as compared with 10 per plant for 1927.

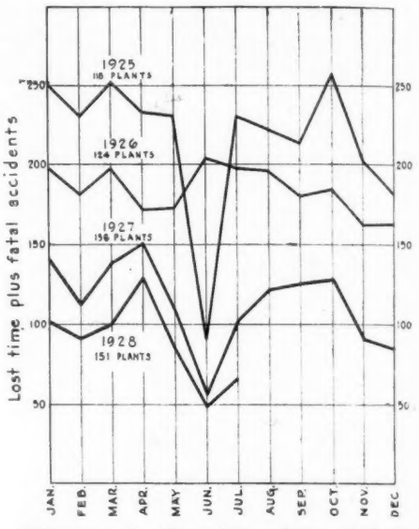


Diagram A. Complete chart of lost-time accidents by months from January, 1925, to July, 1928

Accident frequency grouping for the first half of 1927 is shown by the following, which takes into account all lost time and fatal mishaps:

43 plants operated without accident.
28 plants suffered one accident each.
12 plants suffered two accidents each.
12 plants suffered three accidents each.
12 plants suffered four accidents each.
8 plants suffered five accidents each.

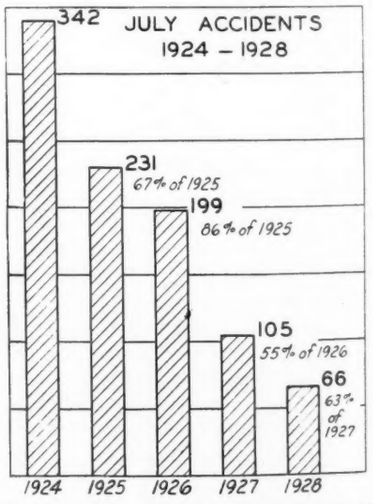


Diagram B. Showing the remarkable decrease in accidents occurring during July for the years 1924 to 1928

7 plants suffered six accidents each.

5 plants suffered seven accidents each.

Three plants had 8 accidents each, two plants each had 9, 10, 11, 12 and 14 accidents and the remaining plants in the study had 16, 17, 18, 21, 25, 27, 30 and 33 accidents respectively. From the above it will be noted that 95 plants had fewer accidents than the average of 3.75 for the entire group of 150, and that the plant which made the most unfavorable record had more accidents than the total of the best 73 on the list.

Mortality of Trophy Contestants

Diagram D gives a graphic picture of the rate at which perfect accident records were shattered in the cement mills during 1927 and 1928 to August 1. Although January is a relatively light operating month, many of the mills annually lose their chances to win the Portland Cement Association trophy by having an accident before February 1. If a mill can run safely until June 1, it seems to have a 50-50 chance of completing the year without accident. Summer months are relatively safe to the well-organized accident prevention work in the mills that avoid accidents during the earlier months, but fall and early winter are hazardous.

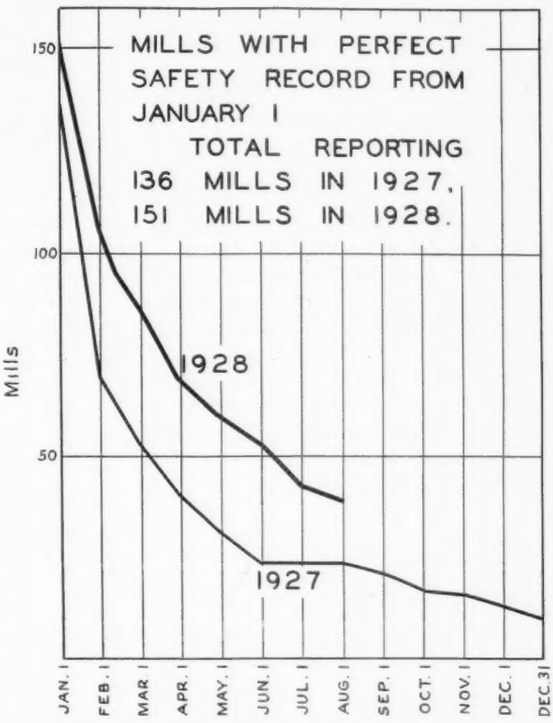


Diagram D. Curve showing the number of mills maintaining a perfect safety record for 1927 and the corresponding curve for the first seven months of 1928

National Safety Congress Meets in New York City, Oct. 1 to 5

THE ANNUAL MEETING of members of the National Safety Council will be held on Monday morning, October 1, in the Hotel Pennsylvania ballroom, New York City, marking the official opening of the seventeenth annual safety congress, which will be in session until the evening of Friday, October 5. Homer E. Niesz, president of the National Safety Council, is to preside.

The annual banquet, which is always one of the numerous features of the national safety congress, will be held at the Commodore Hotel, on Wednesday evening, October 3. The names of the speakers and the subjects they will discuss will be announced in the final edition of the program. More than 6,000 persons are expected to attend the seventeenth annual safety congress, which is to be addressed by 325 speakers. There will be 110 sessions. There will be no charge for admission to any of the business sessions and both members and non-members of the National Safety Council are invited to attend.

Cement Section

What organized safety work has done for the cement industry will be told at a special session devoted to that group. The cement section meeting will be held on Tuesday morning, October 2, at the McAlpin hotel.

After the opening remarks of Chairman Town, there will be a general discussion of "What Organized Safety Work Has Done for the Cement Industry." Walter Clinton, of the Metropiltan Life Insurance Co., is to dwell on "Accident Prevention and Insurance."

Meeting of Quarry and Cement Sections

A joint meeting of the quarry and cement sections will be held on Tuesday, October 2. R. P. Blake, of the Independence Bureau, Philadelphia, is scheduled to deliver a luncheon address and at the afternoon session C. L. Baylor, assistant safety director of the Louisville Cement Co., Speed, Ind., is going to discuss "The Mental Causes of Accidents," following which there will be a round-table discussion led by S. Henry Harrison, assistant superintendent of the Vulcanite Portland Cement Co.

Quarry Section

The quarry section session will be held in the McAlpin hotel on Tuesday morning, October 2, when the meeting will be open to both members and non-members.

"What Safety Means to a Quarry Executive" will be discussed by John Rice, president of the General Crushed Stone Co., Easton, Penn., past-president, National Crushed Stone Association.

J. R. Davis, assistant vice-president of the U. S. Gypsum Co., Chicago, will dwell on "The Company Executive in Charge of Operation and Accident Prevention."

"Getting Tonnage With Safety" is the topic assigned to F. F. McLaughlin, superintendent of quarries, Rock Cut Stone Co., Syracuse, N. Y.

Session for Executives and Engineers

There will be a special session for industrial executives and engineers. Arthur T. Morey, general manager of the Commonwealth Steel Co., Granite City, Ill., may preside at this special session, which will be held on Wednesday afternoon, October 3, at the Pennsylvania Hotel.

H. W. Heinrich, assistant supervisor, engineering division, Travelers Insurance Co., is to talk on "The Origin of Accidents." L. A. DeBlois, director, safety engineering division, National Bureau of Casualty and Surety Underwriters, will discuss "Safety and the Individual." A. W. Berresford, vice-president of the American Engineering Council, is to dwell on "Safety and Production." A. H. Young, Secretary, Industrial Relations Counselors, Inc., will talk about "Safety and Labor Relations."

Superior Portland Gives Second Annual Picnic for Employes

THE second annual picnic given by the Superior Portland Cement Co. of Seattle for its employes was held at Bloom's grove near the company's plant at Concrete, Wash., on August 4. Practically the whole community attended the affair, and with a number of employes from the general offices at Seattle, the attendance reached more than 800. The program opened with a spirited baseball game between teams from the quarry and the mill, which the former won by a score of 6 to 3. In the absence of John C. Eden, president of the company, who was detained from being present due to illness, C. N. Reitze, vice-president, presented the silver cup to Fred Baker, manager of the winning ball team.

James H. Kane, a director of the company, gave a short talk, congratulating the workers on the safety record they have made during the present year without a single lost-time accident to date. Mr. Kane expressed the belief that the plant would close the year with a perfect record. C. L. Wagner, superintendent of the Concrete plant, presented service pins to Frank Bitonti, Ross Zongrone, and L. B. McDaniels for 20 years of service with the company. Pins were also presented to six employes who had been with the company 15 years, and to 12 employes who had worked 10 years for the company.

There was a big athletic program with competitions for the workers, and for the wives and children. The big event of the day, of course, was the picnic dinner of barbecued salmon and everything that should go with it. In the evening, a big dance in the American Legion hall closed the day.

Foreign Abstracts and Patent Review

Effect of Large Excess of Water on Alumina Fused Cement. H. Vierheller claims that statements made in a publication to the effect that alumina cement, as well as alumina cement mortar, cannot be drowned, is incorrect. He compiled considerable data obtained from his experiments to show that the harmful effect of increasing quantities of water is evident.

TABLE 1

7.07-cm. cubes of neat fused alumina cement. Curing: 1 day moist closet, 6 days in air.

Water Pct.	Compressive Strength kg./sq.cm.	Tensile Strength kg./sq.cm.	Specific Gravity
10	425	32.7	2.15
15	824	68.0	2.30
20	812	44.4	2.32
25	836	37.6	2.24
30	630	32.9	2.11
40	545	24.9	1.97
50	488	18.9	1.91
75	270	8.9	1.70
100	73	6.4	1.52

Additional tests were made to show the harmlessness of carbon dioxide (CO_2).

TABLE 2

Mixing Water	Method of Curing	Tensile Strenth in kg./sq. cm. 1d.	2d.	7d.
City water	One day moist air, remainder in city water	30.5	25.8	29.2
Distilled water	One day moist air, remainder in city water	31.7	25.3	25.2
Distilled water	In charged water immediately upon mixing	27.0	29.2	26.2

TABLE 3

Mixing Water	Method of Curing	Tensile Strenth in kg./sq. cm. 1d.	2d.	7d.
City water	One day moist air, remainder in city water	30.5	25.8	29.2
City water	One day moist air, rem. in "aggressive" carbon dioxide	30.7	27.2	28.0
Distilled water	One day moist air, rem. in "aggressive" carbon dioxide	30.8	26.7	26.8
Distilled water	In "aggressive" carbon dioxide immediately upon mixing	27.2	29.7	28.3

—*Tonindustrie-Zeitung* (1928), p. 589, 611.

Grading of Sand and Gravel. The following proposed specifications were submitted at the second session of the Committee on Grading (Berlin, Germany):

GRADING OF SAND, GRAVEL AND CRUSHED STONE

Natural Aggregate Size	Sieve No.*	Designation		Crushed Stone Size	Diameter of sieve opening*	Designation	
<0.06 mm.	100	dust	sand				
0.06 -0.088	70	meal					
0.088-0.2	30	fine					
0.2 -0.6	10	medium		2	2.83	sand	
0.6 -2.0	3	coarse					
	Diameter of sieve opening*						
2- 5	6.21	fine	gravel (Kies)	2- 5	6.21	fine	crushed aggregate (Grus)
5-15	17.51	medium		5- 8	9.6	medium	
15-30	14.5	coarse		8-12	14.3	coarse	
				12-18	20.9	fine	crushed aggr. (Splitt)
				18-25	28.8	coarse	
30	34.5		pebbles†	25-35	40.1	fine	crushed stone, clinker, slag, etc. (Schlag)
40	45.8			35-45	51.4	medium	
50	57.1			45-55	62.7	coarse I	
60	68.4			55-65	74.0	coarse II	
65	74.0			>65	.....	overflow	
70	79.6						
	Not sieved						
0- 5	fine gravel						
0-15	medium gravel						
0-30	gravel						

*Mesh sieves up to 2 mm. size; sieves with round openings for sizes over 2 mm.
†Pebbles indicated by giving the upper and lower limits; for example, 40/65.
Ballast for state railways: 10-20 mm., railway "Splitt" No. 1; 20-30 mm., railway "Splitt" No. 2; 30-60 mm., crushed stone (Schlag).

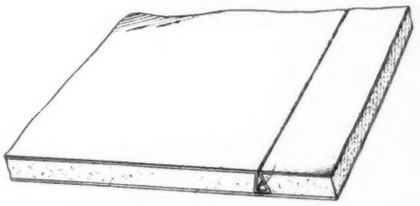
—*Tonindustrie-Zeitung* (1928), 679-680.

Poured Concrete and Strength Specifications. The following conclusions are drawn by Dr. A. Guttmann on the basis of his tests, conducted in connection with an article published by Dr. O. Graf (*Tonindustrie-Zeitung*, No. 86, 1927, p. 1565): 1. It appears unnecessary to supplement the standard tests by tests of mortar of pouring consistency, as its properties, even when the consistency is kept constant, do not permit direct conclusions as to the behavior of poured concrete. 2. Should standard tests call for numerical and comparable values of poured concrete, a standard gravel should first be established, as well as a simple and unquestionably correct method of measuring the consistency of concrete. An agreement should also be reached on the size of specimens, their method of curing, etc. 3. The quantity of mixing water, which is generally too high in poured concrete, reduces the strength of all cements by a considerable amount. Some cement brands are more sensitive to this effect than others. Graf's statement that mixed cements are relatively more harmed than portland cements, is based on insufficient data, as far as the term mixed cements is used to designate slag products. 4. The quantity of mixing water for poured concrete can be easily established in the laboratory as well as in the field by simple tests with the spout at a certain angle. The American flow-table is better adapted to consistency determinations than the device designed by Graf. For precise measurements recourse should be taken to the hydrostatic method recommended by the author. The low strength of poured concrete, as compared with concrete of plastic consistency, makes it particularly adaptable for massive construction of low stress. Small cross sections, where higher stresses are produced, should receive special care in using poured concrete; such measures as good grading of aggregate, increase of cement content and use of trass are recommended. On construction work, where poured concrete presents no special economic advantages, concrete of plastic consistency should be used on account of its superior quality.—*Tonindustrie-Zeitung* (1928), 413-415.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Plaster Board With Beveled Edge. An improved plaster or wallboard with an edge capable of making a neat and close joint with the edges of the adjoining board and one which can be conveniently made on an ordinary board machine is described in the patent. The board is provided with a lower paper sheet and a cover sheet with a plaster body. The edges of the paper are first scored and then folded to make a sharp, beveled edge, the top of the bevel projecting outwardly.



Plaster board with a bevel edge which provides a mortise joint

When two or more of these sheets are fastened to the wall or ceiling as intended, the beveled edges form a dove-tailed mortise which can be filled with plaster. The cement acts as a tenon and makes a neat and strong joint.—*August F. H. Kohler and Alexander S. Speer, assignors to United States Gypsum Co., June* 19, 1928, No. 1,673,944.

Process of Making Asbestos Bodies. Asbestos is heated to a temperature in the neighborhood of its melting point and then, without permitting much cooling to occur, it is subjected to a sufficiently high pressure to consolidate it.—*Hans Gerdien, assignor to Siemens and Halske (Germany). U. S. Patent No.* 1,670,659.

Marketing Policies and Membership Code of Ethics of the Finishing Lime Association of Ohio

THE FINISHING LIME ASSOCIATION OF OHIO (L. E. Johnson, secretary) has issued a booklet for distribution to the trade, which among other interesting material contains the following code:

"(1) All membership lime for building purposes is marketed through dealers; that is, no membership lime is sold direct to the user or contractor for building purposes, thus assuring the dealer that in every transaction involving the use of membership lime the dealer gets his profit.

"(2) All salesmen employed by member companies work their territories in close co-operation with the dealer.

"(3) Building Material Merchants Associations—The Finishing Lime Association is in complete accord with association endeavor and has organized a committee for the purpose of meeting with the lime committees of the organized Building Material Merchants Associations to the end that mutual problems may be discussed.

"(4) Standard of Quality—The Finishing Lime Association recognizes the obligation of producing a quality product. The voluntary adoption of a standard of quality, as a membership requirement, more stringent than the A. S. T. M. specification, is evidence of a desire to meet this obligation.

"(5) The organization of the Finishing Lime Association of Ohio and the establishment of a force of trained engineers in the field, together with the distribution of specifications and folders descriptive of the proper methods of the preparation and application of finishing hydrated lime, is a method designed to extend and improve the uses of their product, as well as a means of meeting the obligations to the dealer, in the creation of confidence in their product.

"(6) Advertising—The members of the association recognize the obligation of the manufacturers in aiding in breaking down sales resistance through advertising and are advertising their product nationally.

"(7) Entertainment—The association and the members believe that the old idea of high pressure entertainment, the taking of a man to the top of a mountain and showing him the promised land is a relic of a past age. The dealer of today knows he eventually pays the bill, and as a result all entertainment is in good taste and of a conservative nature.

"(8) The giving away of material, as a means of creating demand, is unsound and only brings discredit on the product and producer. The membership stands behind this statement 100%.

"(9) The growth of the trade association in the past few years has demonstrated its value, and the members of the Finishing Lime Association have demonstrated their faith in this line of endeavor. Through it they have also shown that competition does not mean industrial warfare, but rather an earnest desire to foster a spirit of progress and a faith in the legitimate dealer and their own product.

"(10) Summarizing, it can be seen that the Finishing Lime Association and member companies are striving toward an ideal and the policies outlined have all been demonstrated to be sound and basic. They pledge themselves to follow them, and to do nothing either directly or indirectly that will leave a loop hole for unfair advantages to creep in to the merchandising chain and thus break down the feeling of confidence between dealer manufacturers and users. And finally recognizing that industry, especially the construction industry, has become highly complex, and that if the present system of the distribution of building supplies is to survive, there must be a fair return of profit realized on the tremendous investment in the building material business, the Finishing Lime Association is heartily in accord with the Building Material Merchants Associations and are ready to co-operate at all times, so that better conditions will prevail."

Republic Portland Cement Co. Organized to Build Projected San Antonio Plant

ORGANIZATION of the Republic Portland Cement Co. has been perfected, it was announced recently by J. H. Smith, president of the new corporation. The corporation will build the $2,500,000 cement plant on the Austin Road, recently projected by the Smith interests. The new plant will have a capacity of 1,000,000 bbl. per year. The new company is headed by J. H. Smith, president, W. M. Thornton, vice president in active charge, F. A. Smith, J. W. Young and A. F. Sayers. Engineering work for the company is being done by Terrell Bartlett of San Antonio and Richard K. Meade, cement authority of national prominence, who will act as consulting engineer.

The company's product will be marketed under the trade name of "Longhorn" cement and the head of the Texas longhorn steer will be used as a trademark on every sack, it was announced.

Some time ago Smith Brothers announced their plans for a large cement plant 10 miles north of San Antonio on the Austin highway and between the main lines of the M. K.-T. and Missouri Pacific railroads. A site for the plant, consisting of more than 600 acres was purchased. (The original announcement was published in ROCK PRODUCTS, June 9, 1928.)

Construction work is already under way at the site. Two wells have been drilled for water and construction equipment will be on the ground shortly. A contract has been signed with the San Antonio Public Service Co. for electric power and that company will build a large sub-station to serve the new industry. Natural gas will be purchased from the Southern Gas Co. of San Antonio. Excluding one other manufacturing concern the new company will use as much natural gas in manufacturing its product as is consumed by the entire city of San Antonio.

This plant will manufacture cement by the wet process. Its major machinery units will consist of two 11x250-ft. kilns, four 8x7x40-ft. compeb mills for grinding, two 10x100-ft. coolers, and a large Dixie hammer mill for crushing. Orders for the kilns, mills and coolers have already been placed with the Allis-Chalmers Manufacturing Co., Milwaukee. The first of these will be shipped about the latter part of September, the balance coming forward as rapidly as provision can be made for its installation. Contracts have been let to the General Electric Co. for the installation of all electrical equipment which includes four 800-hp. motors, two 300-hp. units, and about eight motors of 100 hp. each. There will be a 7½-ton P. & H. electric crane made by the Harnischfeger Corp., Milwaukee, Wis., which will travel over a 70x350-ft. span in hauling raw materials.

The company will build a modern community to house its employes as soon as the main buildings are completed. This community will be known as Longhorn, Texas, and will be the shipping point for the product. The community will have its own waterworks and sewer system.

The site for the plant, according to tests conducted by Mr. Meade, will provide sufficient raw materials for more than 50 years of operation. The strata found here is particularly adapted to the manufacture of a high early strength and uick hardening cement, it is stated.

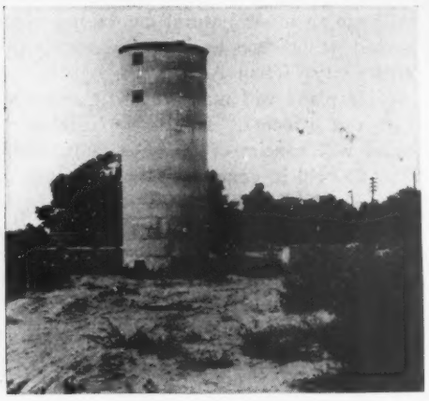
J. H. Smith, president of the company, has practically retired from the contracting field to devote all his efforts to the new enterprise.

Annual Meeting of Highway Research Board

ANNOUNCEMENT is made by Roy W. Crum, director, that the eighth annual meeting of the Highway Research Board of the Division of Engineering of the National Research Council is to be held December 13 and 14, 1928, at the building of the National Academy of Sciences and the National Research Council, B and 21st streets, Washington, D. C.

First American Plant Specifically Designed to Make "Velo" Portland Cement

IN the May 14, 1927, issue of ROCK PRODUCTS the announcement was made that the Missouri Portland Cement Co. was going to erect a plant to manufacture the new quick-hardening cement that was developed in Denmark about three years ago. This cement is not a high alumina cement, but a true portland cement. The methods of manufacture are more refined and require a more careful control of the different operations than is customary in the manufacture of ordinary portland cement.



Coal storage silo at the new plant at Prospect Hill, Mo.

The advantages of "Velo," the name being taken from the Greek meaning, quick, is as the name implies, a cement that has quick hardening properties, developing a high tensile and compressive strength in 24 hours. The Missouri Portland Cement Co. will market this product under its own trade name of "Prestolith Velo," or quick stone.

By way of illustration the following table will give an idea as to the strength developed as compared to ordinary cement:

Tensile strength	One day	3 days	7 days	28
Ordinary	.....	.....	225	325
Velo	340	413	432	.....

Cement storage silos at the "Velo" plant of the Missouri Portland Cement Co.

Uncompleted gypsum storage bin

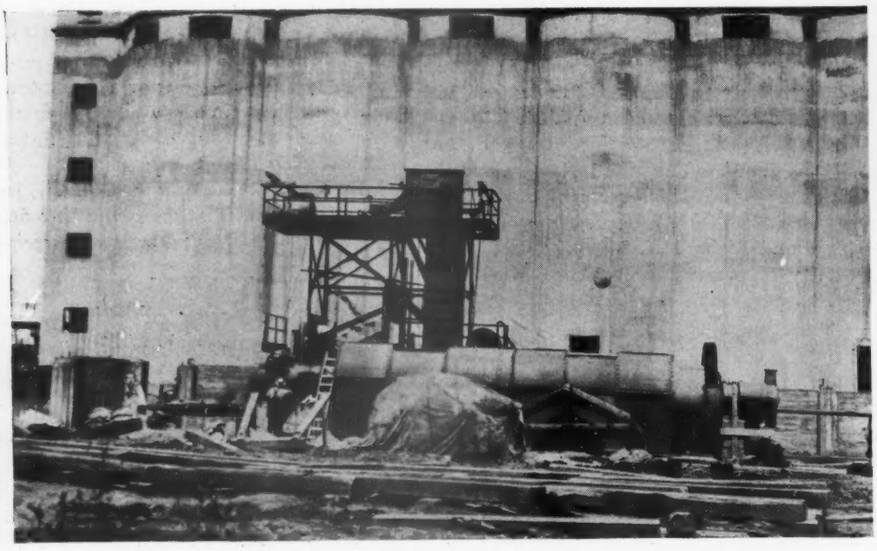
Compressive strength	One day	3 days	7 days	28
Ordinary	510	1146	.....	2588
Velo	1750	3304	5614	.....

This plant was visited on a recent editorial trip. The construction of the plant is well under way and probably it will be in operation in 60 to 90 days.

At the old plant, which was changed from a dry to a wet process a few years ago, some "Velo" has been made, but of course this temporarily stops the manufacture of the ordinary cement, while the equipment is being used for the quick-hardening cement. The production was used in and around St. Louis. One place where the new cement was used was on the recent paving of Olive street, the intersections being laid with this product. Traffic, by the use of this cement, was held up only during the night and part of a day, which under the old procedure would have been tied up a week at least. Several public building remodeling jobs were being done with this cement.

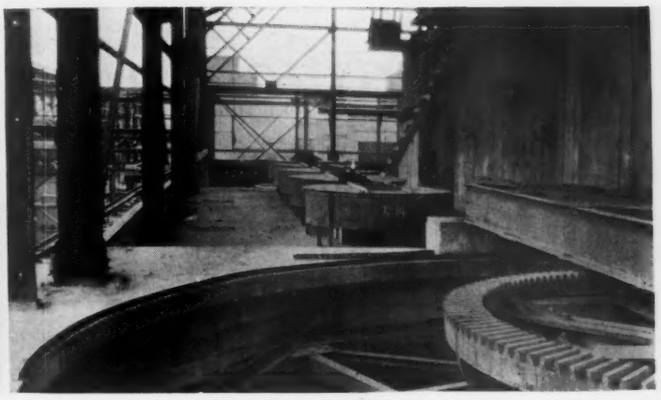
Stack and partial view of kiln

The new plant is being built alongside the older wet process plant, which is located at Prospect Hill, St. Louis county, which is roughly six miles north of the business section of St. Louis proper. The plant is fireproof construction throughout. Silos are all



Coal pulverizer and drier combined in one unit, installed at the Missouri plant, and ready for eection of building over it

Pump for delivering pulverized coal to kiln storage tank



Clay mill in the foreground with slurry basins beyond

of reinforced concrete and the balance of the structure is steel. The buildings will be enclosed in corrugated asbestos-cement siding.

The limestone for this plant will come from the company's quarry at Bellfontaine, Mo., which is eight miles up the Missouri river from St. Louis. Clay will be taken from the pit that supplies the older plant a few hundred yards north of the new plant. Most of the equipment is being supplied by F. L. Smidth and Co.

Three local concerns are doing the erecting. Fruin, Colon Contracting Co. of St. Louis, Mo., have all the construction work outside of the stack and silos. Boland Construction Co. built the former and the later built by the Gamble Construction Co.

Later, when this plant is ready to operate, we hope to publish a complete description of the operation in Rock Products.

Two New Alabama Gravel Plants in Operation

As readers of Rock Products are doubtless aware, the Montgomery, Ala., district is one of the largest and most progressive in the sand and gravel industry. We have had occasion to describe new plants there almost every year. This year will be no exception because two of the principal producers of this district have just completed new plants.

The new Flomation, Ala., plant of the Roquemore Gravel Co., Montgomery, Ala., has just been placed in operation. The Alabama Sand and Gravel Co., Montgomery, has completed and placed in operation a new plant to take material from a pit operation opened in April, 1927. The new plant avoids a long haul to the older plant. We will have more about these new plants to publish later.

THE SATURDAY EVENING POST

MISSOURI PORTLAND CEMENT COMPANY

Prestolith

VELO CEMENT

Costs little more than standard portland cement
Makes concrete you can use in 24 hours

THE SATURDAY EVENING POST

Place it today
-use it tomorrow

America's prosperity has been attained by speeding industrial processes. Now Prestolith Velo Cement brings new acceleration to the building industry.

THERE'S a new magic in speeding construction — Prestolith Velo Cement. All over the world, at any moment, men are waiting for concrete to harden. Often this means the loss of many thousands of dollars in wasted time while overhead goes on. But concrete — the most versatile building material the world has ever known — has still another chapter to write in the progress of construction — a chapter which introduces Prestolith Velo, a high early strength cement that makes concrete you can place today and use tomorrow.

There is something inspiring — something almost magical — in the rush of power tied up in a bag of Prestolith Velo.

Imagine a concrete street in a busy city on which traffic can be admitted 24 hours after it is poured. Consider a factory whose production is valued at many thousands of dollars a day, saving weeks of time on construction or replacements. Think of the construction of a large office or store building on an expensive site. Its earning power begins only with occupancy. Every floor delays all the work above it until it is finished. With Prestolith Velo, many days can be saved on each floor.

Prestolith Velo practically eliminates the costly delays before concrete can bear heavy loads. Yet for all its remarkable time-saving qualities, it costs only slightly more than standard portland cement.

The introduction of Prestolith Velo to the building industry indicates an inherent capacity for engineering service which has had a vital part in the rather unusual growth of the Missouri Portland Cement Company.

It represents an absorbing interest in the improvement of construction methods and materials which has prompted the investment of ability and money in the most exhaustive and conclusive tests of Prestolith Velo Cement in the laboratory and in actual work on a commercial scale over a period of five years.

And it represents the vision of complete usefulness which has caused, as a result of these tests, the building of a new $2,000,000 plant at Prospect Hill, St. Louis, for the exclusive and commercially adequate production of Prestolith Velo Cement.

Further seats and inquiries are heartily invited. Send for our interesting booklet, "24-Hour Cement." The coupon below will bring it to you by return mail.

MISSOURI PORTLAND CEMENT CO.

ST. LOUIS · · KANSAS CITY · · MEMPHIS

Manufacturers of Red Ring Portland Cement, Prestolith Velo Cement, producers and distributors of sand, gravel and Bethany Falls crushed stone.

Recent announcement of "Velo" cement issued by the Missouri Portland Cement Co.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone flux Week ended July 28	Limestone flux Week ended Aug. 4	Sand stone and gravel Week ended July 28	Sand stone and gravel Week ended Aug. 4
Eastern	3,827	3,657	18,020	18,165
Allegheny	3,935	3,665	10,892	11,404
Pocahontas	627	602	1,269	1,033
Southern	553	596	11,814	11,914
Northwestern	2,090	2,110	10,442	10,414
Central Western	467	504	14,491	14,039
Southwestern	490	396	7,754	7,715
Total	11,989	11,530	74,682	74,684

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux Period to Date Aug. 6	Limestone Flux Period to Date Aug. 4	Sand, Gravel and Stone Period to Date Aug. 6	Sand, Gravel and Stone Period to Date Aug. 4
Eastern	99,351	84,150	277,526	272,046
Allegheny	107,397	98,311	226,954	195,598
Pocahontas	14,976	13,481	26,246	24,179
Southern	17,128	16,986	363,597	318,179
Northwestern	41,501	38,773	198,198	179,983
Central Western	15,426	12,777	271,311	294,806
Southwestern	9,634	12,803	165,676	179,425
Total	305,413	277,281	1,529,508	1,464,216

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	1928
Limestone flux	*305,413*	*277,281*
Sand, Stone, gravel	*1,529,508*	*1,464,216*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning August 25:

SOUTHERN FREIGHT ASSOCIATION DOCKET

41420. **Sand**, from Vildo, Tenn., to Indiana, Illinois and Wisconsin destinations. In lieu of lowest combination rates now applicable, it is proposed to establish the following through rates on sand, carloads (See Note 3), from Vildo, Tenn.: To Indianapolis, Ind., 300c; Noblesville, Ind., 310c; Abingdon, Chicago, Ill., 340c, and to Milwaukee, Wis., 403c per net ton.

41479. **Sand** or waste, from Winston-Salem, N. C., to Quincy, Ill. Lowest combination now applies. Proposed rate on sand or waste (See Note), in packages or in bulk, carloads, minimum weight 30,000 lb. Note—Rates to apply only on sand or waste, released by the U. S. government from internal revenue tax from Winston-Salem, N. C., to Quincy, Ill., 925c per net ton, to apply via N. & W. Ry., through Cincinnati, same as rate now in effect in connection with the Southern Ry., Harriman, Tenn., Danville and Louisville, Ky.

41500. **Limestone, ground or pulverized**, between stations on the Clinchfield R. R. It is proposed to establish a mileage scale of rates on limestone, ground or pulverized, carloads, minimum weight 60,000 lb., for application on interstate traffic, and on intrastate traffic in Tennessee, observing the single line scale approved for application between points on the A. C. L. R. R. in connection with Submittal No. 40203. In publishing the mileage scale, it is also proposed to cancel specific rates now published from Ashford, N. C., Erwin and Johnson City, Tenn., to all points on the Clinchfield R. R. Proposed scale to apply between stations on the Clinchfield R. R.

4150. **Limestone, ground or puverized**, from Kingsport, Tenn., to southern points—cancellation. It is proposed to cancel on the obsolete theory, the present published rates on ground or pulverized limestone, carloads, from Kingsport, Tenn., to points in Georgia, Kentucky, North Carolina, South Carolina, Tennessee and Virginia as named in Clinchfield R. R. I. C. C. 983. Classification rating to apply after cancellation.

41592. **Limestone, whitestone or marble, ground, powdered or pulverized**, between stations on the L. & N. R. R. It is proposed to establish mileage rates on limestone, whitestone or marble, ground, powdered or pulverized, including dust or fine screenings, carloads, minimum weight 60,000 lb. applicable on interstate traffic between points on the L. & N. R. R. in the states of Kentucky, Tennessee, Alabama, Florida, Georgia, Mississippi, Louisiana, Virginia and North Carolina, and on intrastate traffic between points on the L. & N. R. R. within the states of Kentucky, Tennessee, Florida, Mississippi, Louisiana, Virginia and North Carolina. The suggested scale represents the proposed Georgia-Alabama scale, less 10%. The proposed rates to be published in a new tariff to be compiled by or for account of the L. & N. R. R. and this tariff to refer to L. & N. R. R. Distance Tariff (L. & N. R. R., I. C. C. A-15487) for table of distances to be used in applying the proposed rates. The suggested mileage tariff is not to cancel any specific commodity rates now published on commodities involved where such specific rates are the same as the proposed mileage rates for the distance. Furthermore, where commodity rates are now published on (1) Agricultural ground limestone, carloads, or (2) Stone, agricultural (ground limestone), carloads, the descriptions covering such rates to be amended to be the same as suggested herein in connection with the proposed mileage rates. A statement showing the proposed mileage will be furnished upon request.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

TRUNK LINE ASSOCIATION DOCKET

19345. **Agricultural land, chemical, gas or glass, lime**, carloads, minimum weight 30,000 lb., also **ground limestone**, carloads, minimum weight 50,000 lb., from **Pleasant Gap and Bellefonte, Penn.**, to New Cumberland, Penn., 10c per 100 lb. Reason—Proposed rates are comparable with rates now in force to **Lemoyne, Steelton and Harisburg, Penn.**

19360. **Sand, blast, engine, foundry, glass molding or silica**, carloads (See Note 2), from Cascade, Greer and Sturgisson, W. Va., to B. & O. R. R. and Monongahela Ry. points, rates ranging from 90c to $2.10 per ton of 2000 lb. Reason—Proposed rates compare favorably with rates from Berkeley Springs, W. Va., to same points of destination.

19391. **Gravel and sand**, N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), to D. & H. Co. stations, Green Ridge, Carbondale, Waymart, Penn., Windsor, Ninevah, Sidney, Oneonta, Colliers, N. Y., and various, and C. & C. V. R. R. points to Portlandville to Cooperstown, N. Y., incl., from Sherburne, N. Y., rates ranging from $1.10 to $1.80, from Whitney Point, N. Y., rates ranging from 95c to $1.70 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

19398. To cancel carload commodity rates on **building sand, sand** (other than blast, engine, fire, foundry, glass, molding or silica) **and gravel**, N. O. I. B. N. in O. C., from Earl, Penn Yan, N. Y., Lock Haven, Frenchville, Cherry Tree, Patchen, Patton and Carrolltown, Penn., to destinations on the N. Y. C. R. R. as per N. Y. C. Tariff, New York City, I. C. C. No. 15406. Sixth class rates to apply. Reason—Investigation develops that no traffic has moved for some time and there is no prospect of future movement, therefore rate is obsolete.

19406. **Gravel and sand**, N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, sand, carloads (See Note 2), from Wharton, Kenvil and Succasunna, N. J., to Mount Pocono, Penn., $1.05 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in same general territory.

19420. **Crushed stone**, carloads (See Note 2), from Northampton, Penn., to various Pennsylvania points ranging from 60c to $1.40 per ton of 2000 lb. Reason—Proposed rates are fairly comparable with orders involved in similar movements.

19421. **Sand and gravel**, carloads (See Note 3), from Masonville to South Pemberton, N. J., incl., to Irvington, N. J., $1.50 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates involved in similar hauls.

19426. **Fluxing stone, carloads (See Note 2)**, from Gouverneur, N. Y., to Pottsdam, N. Y., 88c per ton of 2240 lb. Reason—Proposed rate compares favorably with rates for similar distances.

19427. **Sand and gravel**, carloads (See Note 2), from Farmingdale, N. J., and South Lakewood, N. J., to Point Pleasant, N. J., 70c per ton of 2000 lb., subject to Rule 77. Reason—Proposed rate compares favorably with other rates involved for similar hauls.

19428. **Sand** (other than blast, engine foundry, glass, molding or silica) **and gravel**, N. O. I. B. N. in O. C., carloads (See Note 2), from Ballina, N. Y., to Bingley to Truxton, incl., $1, and to East Homer to Cortland, N. Y., incl., $1.10 per ton of 2000 lb. Reason—Proposed rates compare favorably with rates involved for similar distances.

19443. **Sand (other than blast, engine, fire**, foundry, glass, molding and silica) **and gravel**, N. O. I. B. N. in O. C. carloads (See Note 2), from Clarence, N. Y., to Akron, N. Y., 55c per ton of 2000 lb. Reason—Proposed rates compare favorably with rates on like commodities for similar distances, conditions and services.

19461. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex; also **gravel**, carloads (See Note 2), from Lewes, Del., to Mamaroneck, N. Y., $3.80 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Wilmington, Del., to Mamaroneck, N. Y., and Boston, Mass.

19464. **Trap rock, mine rock, broken stone and crushed stone and stone screenings**, in bulk, carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Apulia and Tully, N. Y., 65c per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services or conditions.

WESTERN TRUNK LINE DOCKET

1376Y. **Sand, silica**, crude, carloads (See Note 1), but not less than 60,000 lb., except where car of less than 60,000 lb. capacity is furnished at carrier's convenience, the marked capacity of the car will apply. From Wilmore, Kan., to St. Louis, Mo., and East St. Louis, Ill. Present, 35c, class E; proposed, 19c per 100 lb.

CENTRAL FREIGHT ASSOCIATION DOCKET

19214. To establish on **crushed stone**, carloads, Ransoms, Ohio, to Detroit, Mich., rate of 95c per net ton. Route—Via Sandusky or Clyde, Ohio, and the N. Y. C. R. R. (west). Present rate, 16c.

19215. To establish on **sand and gravel**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, Winona Lake, Ind., to Laotto, Ind., via Penna R. R. Rate of 70c per net ton. Present rate, 75c per net ton.

19216. To establish on **stone, broken, crushed, rip rap, screenings, rubble and crushed granite**, in

open top equipment, carloads, Kewaunee, Manitowoc or Milwaukee, Wis. (across lake via car ferry), to Alliance, Ohio, rate of 250c per net ton. This rate to apply only on shipments originating west of Kewaunee, Manitowoc and Milwaukee, Wis., from points from which no through rates are in effect. Present rate, sixth class.

19217. To establish on **gravel and sand**, except blast, core, engine, filter, fire of furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, Rockford, Ind., to points in Indiana, rates as shown below:

To B. & O. R. R. Stations	Proposed	Present
Mitchell	95	107
Riverdale	90	107
Tunnelton	90	104
Fort Ritner	85	104
Sparksville	85	104
Medora	85	97
Valonia	80	97
Brownstown	80	92
Hayden	80	92
Butterville	85	92
Nebraska	85	104
Holton	90	104
Osgood	90	104
Delaware	95	104
Pierceville	95	115
Milan	95	115
Moores Hill	95	115
Cold Springs	100	115
Dillsboro	100	115
Cochran	105	115
Aurora	105	115
Lawrenceburg	105	117
Lovett	85	90
Commiskey	85	95
Paris	85	95
Deputy	90	95
Blocher	90	100
Lexington	95	100
Nabb	95	100
Marysville	95	105
Otisco	100	105
Charlestown	100	110

19219. To establish on **sand and gravel**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, Winona Lake, Ind., to North Manchester, Ind., via Penna. R. R., rate of 70c per net ton. Present rate, 76c per net ton.

19221. To establish on **crushed stone**, in bulk only; **crushed stone screenings**, in bulk only; **limestone, agricultural** (not ground or pulverized), in bulk, in open top cars only; **stone tailings**, carloads, Narlo, Ohio, to points in Ohio, rates as shown below. Present and proposed per net ton:

To (B. & O. R. R. Stations)	Present	Proposed
Wayland, Ohio	$1.40	$1.25
Newton Falls, Ohio	1.40	1.35
Tippecanoe, Ohio	1.50	1.35

19226. To establish on **molding sand**, carloads, Springfield, Ohio, to Buffalo, N. Y., rate of 277c per net ton. Present rate—Sixth class, viz., 24½c.

19227. To establish on **sand and gravel**, carloads, Kern, Ind., to points in Illinois, N. Y. C. R. R. stations. Proposed rates per net ton:

	Prop.		Prop.
West Kankakee	88	Cardiff Junction	101
Greenwich	88	Blair	101
Van's Siding	88	Dwight	101
Lehigh	88	Sunbury	101
Goodrich	101	Adams	101
Union Hill	101	Rudd	113
Clark City	101	Missal	113
Reddick	101	Streator	113

Present rate, sixth class.

19235. To establish on **sand and gravel**, carloads, Brevoorts, Ind., to stations on the B. & O. R. R. (west) in Illinois and Indiana, rates as shown below. Proposed rates, in cents per net ton:

To B. & O. R. R. Stations	District	Proposed
Salem, Ill.	84	111
Bannister, Ill.	80	111
Iuka, Ill.	76	110
Greendale, Ill.	71	110
Xenia, Ill.	67	110
Kenner, Ill.	64	105
Flora, Ill.	59	100
Clay City, Ill.	52	100
Noble, Ill.	44	100
Higgins, Ill.	41	100
Olney, Ill.	37	95
Clarmont, Ill.	31	91
Sumner, Ill.	25	91
Bridgeport, Ill.	19	85
Lawrenceville, Ill.	15	85
Fritchton, Ind.	10	80
Wheatland, Ind.	17	80
Washington, Ind.	24	80
Black Oak, Ind.	29	86
Montgomery, Ind.	31	86
Cannelburg, Ind.	34	86
Loogootee, Ind.	38	90
Shoals, Ind.	47	100
Willow Valley, Ind.	52	100
Huron, Ind.	56	100
Georgia, Ind.	62	105
Mitchell, Ind.	67	105

Present rates, sixth class.

19249. To establish on **crushed stone**, carloads, Findlay, Ohio, to Saginaw, Mich., rate of 145c per 2000 lb. Route—Via N. Y. C. R. R., P. M. R. R. or N. Y. C. R. R., M. C. R. R. Present rate—Sixth class.

19250. To establish on **crushed stone**, carloads, East Liberty, Ohio, to Ashley, Ohio, rate of 80c per net ton. Present rate—Sixth class.

19251. To establish on **crushed stone**, carloads, East Liberty, Ohio, rate of 85c to Alger, Ohio, and 80c per 2000 lb. to McGuffey, Ohio. Present rate—Sixth class.

19252. To establish on **crushed stone**, carloads, Lewisburg, Ohio, to Newtown, Ohio. Rate of 90c per net ton. Present rate—95c per net ton.

19253. To establish on **sand, viz., blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding and silica**, carloads, Glass Rock, Glenford, Thornville and Yost, Ohio, to Charleston, W. Va. Rate of 176c per net ton. Present rate—202c per net ton.

19263. To establish **core sand**, carloads, from Midland and Smith's Crossing, Mich., to Pontiac, Mich. **Rate of 126c per net ton. Present rate—** 139c per net ton.

19272. **To establish on sand and gravel**, carloads, Sturm and Dillard Siding, Ohio, to Toledo, Ohio, rate of 140c per net ton. Route—Via C. & O. Ry., Columbus, Ohio, and H. V. Ry. Present rate—18½c.

19273. To establish on **sand and gravel**, carloads, South Dayton, Ohio, to New Bremen, Ohio, rate of 115c per net ton. Present rate—Sixth class.

SOUTHWESTERN FREIGHT BUREAU DOCKET

15519. **Stone**, from Batesville, Ark., to New Orleans, La. To establish rate of 31½c per 100 lb. on stone, carloads, description and minimum weight as per Item 1300 of W. T. L. Tariff No. 106G, from Batesville, Ark., to New Orleans, La. The proposed rate, it is stated, is now in effect from Carthage, Mo.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4587. **Sand and gravel**, to Bluford, Ill. (in cents per net ton 2000 lb.):

From—	Present	Proposed
Metropolis, Ill.	Mileage	100
Brookport, Ill.	Mileage	100
Cairo, Ill.	Mileage	100
Palestine, Ill.	Mileage	100
Merom, Ind.	Mileage	100

Crushed stone, to Bluford, Ill. (in cents per net ton of 2000 lb.):

From—	Present	Proposed
Shelterville, Ill.	Mileage	100
Krause, Ill.	Mileage	100
Stolle, Ill.	Mileage	100
Anna, Ill.	Mileage	100
Falling Springs, Ill.	Mileage	110

See Note 1.

1526, Sub. 12. **Crushed stone**, carloads (See Note 1), from Anna, Ill., to West Frankfort, Ill. Route—Via Ill, Cent. R. R. and C. B. & Q. R. R. Present rate—None via C. B. & Q. R. R. Proposed rate—$1.10 per 2000 lb.

4616. **Crushed stone**, in bulk, in open cars; **crushed stone screenings**, in bulk, in open cars, carloads. To establish following commodity rates from Marshall, Ill., to Illinois destinations:

To (representative points)	Present	Proposed
Farrington, Ill.	$1.40	$ .65
Vevay Park, Ill.	1.40	.75
Effingham, Ill.	1.80	.88
Collinsville, Ill.	2.50	1.01
Ferrell, Ill.	1.40	.65

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

15128. **Molding sand**, carloads (See Note 3), from Elnora, N. Y., Mechanicville, N. Y., Reynolds, N. Y., Schaghticoke, N. Y., Schuylerville, N. Y., Scotia, N. Y., Saratoga Springs, N. Y., Stillwater, N. Y., Wayville, N. Y., and Ushers, N. Y., to West Albany, N. Y., 7c. Reason—To grant a commodity rate to West Albany, N. Y., comparable with rates now effective to other points in the same vicinity.

15130. **Stone, crushed**, carloads, in bulk, in open cars (See Note 2), from Westfield, Mass., to Williamstown, Mass., $1.60 per net ton (to expire November 15, 1928, unless sooner cancelled, changed or extended), via N. Y. N. H. & H., Northampton, Mass., B. & M. R. R. Reason—To permit of the traffic moving via rail which it cannot do at present class rate.

15132. **Stone, crushed**, carloads, in bulk, in open cars (See Note 2), from East Wallingford, Conn., and Middlefield (Reed's Gap Quarry), Conn., to Mansfield, Conn., $1.40 per net ton (to expire with December 31, 1928, unless sooner cancelled, changed or extended). Reason—To put Reed's Gap Quarry on the same basis as the quarries at Meriden and Rocky Hill, Conn.

15137. **Sand**, core, carloads (See Note 2), from East Providence, Fox Point, R. I., to Bound Brook, Carteret, Elizabeth, Jersey City, Newark, New Brunswick, Trenton, West Mahwah, N. J., Philadelphia, Penn., 18½c. Reason—To provide same rate as is now in effect from a contiguous point.

15139. **Bird gravel and sand**, carloads, minimum weight 60,000 lb., from Keene, N. H., to New York, N. Y., 20c, via B. & M. R. R., So. Vernon, Vt., and C. V. Ry. Reason—To grant shippers a rate to New York, N. Y., comparable with rates now published to New England points.

15159. **Common sand**, carloads, minimum weight 60,000 lb., except that when the capacity of car is less than the actual capacity of car shall govern, but in no case shall minimum weight be less than 40,000 lb., from East Swanson, Vt., to Gantic, Que., $1 per net ton. Reason—Rate necessary in order to move the traffic.

15169. **Stone, broken or crushed**, in bulk, in open cars, carloads (See Note 2), from Meriden (York Hill Quarry), Conn., to Northford, Conn., 85c per net ton. Reason—To permit of movement at a rate comparable with other local rates from some origin points to points in the vicinity of Northford, Vt., and to keep the movement in rail lines.

15183. **Bird gravel and sand**, carloads, minimum weight 60,000 lb., from Keene, N. H., to Chicago, Ill., 33½c; to St. Louis, Mo., 39½c. Reason—To grant shippers same rate on bird gravel and sand as now in effect on similar commodities to Chicago, Ill., and St. Louis, Mo.

Kansas Cement Rate Controversy

THE KANSAS supreme court has issued an order staying, in part, a temporary injunction granted recently by the Shawnee county district court enjoining a new rate schedule ordered by the public service commission for the Kansas Utilities Co.

The stay was issued on application of the Consolidated Cement Corp. of Mildred, Kan., and affected rate schedules applicable to that company. The cement company was required to post a $50,000 bond as surety for payment of the difference in its old rate schedule and a higher schedule which the commission disapproved and which the utilities company sought to make effective.—*Topeka* (Kan.) *Journal.*

Opposes Rates on Cement to New England

A RECOMMENDATION that the Interstate Commerce Commission finds unreasonable the present freight rates on cement, in carloads, from points in the Hudson district of New York and the Lehigh district of Pennsylvania to destinations in New England, is made in a proposed report by Attorney-Examiner John T. Money, made public by the commission on August 27 in Atlas Portland Cement Co. vs. Central Railroad of New Jersey, et al. No. 18112. Distance scales of rates are proposed for application in the future.

I. C. C. Decisions

19144. Cement Rate. Rate of 31 cents applicable to cement from Boyles and North Birmingham, Ala., to New Iberia, Morgan City, and Thibodaux, La.

19875. Cement Rates. Combination rate of 32 cents charged on one carload of cement from North Birmingham, Ala., to Robbinsville, N. C., was inapplicable, and that 29.5 cents was the applicable rate.

U. S. Gypsum Gets Permit to Build East Chicago Plant

OBJECTION of the East Chicago, Ind., municipal government to the proposed construction of a $1,500,000 plant in that city by the United States Gypsum Co. of Chicago was withdrawn recently when Mayor Raleigh P. Hale ordered the city building commissioner to issue a building permit, previously withheld, after receiving a favorable report from a council committee on its return from an inspection trip in the east. When he ordered Bert Newell, city building commissioner, to defer action on the gypsum company's application several weeks ago, Mayor Hale indicated he did so because of fear of another industrial nuisance such as the cement dust which the city has been fighting for years.

However, the health committee of the city council, who with City Engineer Zeph Campbell, returned recently from Staten Island, N. J., where they had inspected a plant similar to that which the gypsum company intends to build in East Chicago, gave the plant their official approval. The committee reported that they found the New Jersey plant located in a desirable district, but conferences with property owners in the vicinity revealed no dissatisfaction with its method of operation. Dust-collecting systems eliminated the objectionable qualities of the plant, it was stated.

With the issuance of the building permit actual construction work on the new factory is expected within the next few weeks. Excavating had been going on during the time the permit was withheld, the first contract having been awarded to the A. F. Hartigan Construction Co., Hammond, Ind., covering clearing, grubbing, grading and excavation.

The Gypsum company told Mayor Hale that the plant will employ 140 men and these men, insofar as possible, will live in East Chicago. It was stated that in the first year of operation 6 to 7 boats will be used for transportation to and from the industry. Officials of the company expect to have the first part of the plant operating by June 1 next spring.—*Gary* (Ind.) *Post-Tribune.*

National Gypsum Co. Buys Luckey Lime and Supply Co., of Ohio

INTENT ON providing the building industry with a complete line of building materials under the "Gold Bond" name and protection, the National Gypsum Co., Buffalo, N. Y., announces the production of "Gold Bond" lime at the recently purchased plant and quarries of the Luckey Lime and Supply Co. near Woodville, Ohio.

"For more than a year, we have been searching for lime deposits possessing the necessary purity to permit the production of a lime with such superior quality that it could be given the 'Gold Bond' name and protection," states J. F. Haggerty, president of the National Gypsum Co. The rest of Mr. Haggerty's announcement follows:

"In surveying the lime properties of the country, we were strongly impressed with the high quality of the lime and the splendid production facilities of the Luckey Lime and Supply Co. Greatly to our surprise, we found that the owners of this company were ready to dispose of their holdings to a strong company which could merchandise the product of their mills in a proper way.

"Accordingly, we have purchased the entire holdings and plants of the Luckey company, the control passing immediately into the hands of the National Gypsum Co. This should be a most fortunate arrangement for all parties concerned, as the Luckey lime deposits assay 99.24% pure calcium and magnesium carbonates, assuring 'Gold Bond' lime occupying the same high position that is held by 'Gold Bond' plaster and 'Gold Bond' plaster boards.

"The rapid extension of the National Gypsum Co.'s dealer organization, which has brought National from fortieth to third place in the gypsum industry in the past two years, provides a ready outlet for lime. Having experienced the sound business sense of handling building products protected by the 'Gold Bond' guarantee, National dealers will be ready to welcome 'Gold Bond' lime as a further strengthening factor in their control of the quality business in their local markets."

"The lime will be produced under exceedingly favorable conditions. The Luckey holdings and plant equipment has a valuation considerably in excess of half million dollars. Equipped in the most modern manner, using lime rock of unsurpassed purity, operating under markedly efficient control, the 'Gold Bond' lime plant is ready to produce in large volume under exacting scientific control.

"In obtaining this property in the Woodville district, the National Gypsum Co. is in position to enter the lime market as thoroughly equipped as if its lime plants had been in operation for many years. The product already has shown its marked superiorities on many important contracts in practically all parts of the country.

"The fundamental merchandising plan in back of all 'Gold Bond' building products has had a universal appeal to dealers who are building their business on a quality basis. 'Gold Bond' lime, like 'Gold Bond' plaster, plaster-board, lath board, tile board, insulation, plastic paint and the new ⅝-in. plaster board will be sold under the definite 'Gold Bond' guarantee which has come to mean assured satisfaction to architects, contractors, builders and property owners everywhere."

American Aggregates Corp. Acquire Granite Sand and Gravel Co.

ACCORDING to a recent report in the *Indianapolis* (Ind.) *News,* the American Aggregate Corp. of Greenville, Ohio, has purchased all of the lands, equipment and other property of the Granite Sand and Gravel Co. of Indianapolis. The deal was announced by Willis K. Miller, president of the Granite Sand and Gravel Co., but the price paid for stock by the large corporation was withheld. It was reported on reliable authority, however, that the sale involved considerably more than $1,000,000.

The report states that the American Aggregates Corp., which is one of the largest producers of sand and gravel in the country, intends to make Indianapolis one of its largest carload distributing points. Negotiations already had been been made by the Granite company to have its plant served by a spur switch of the Belt railroad and a goal had been set for the shipment of 100 carloads of gravel and sand daily.

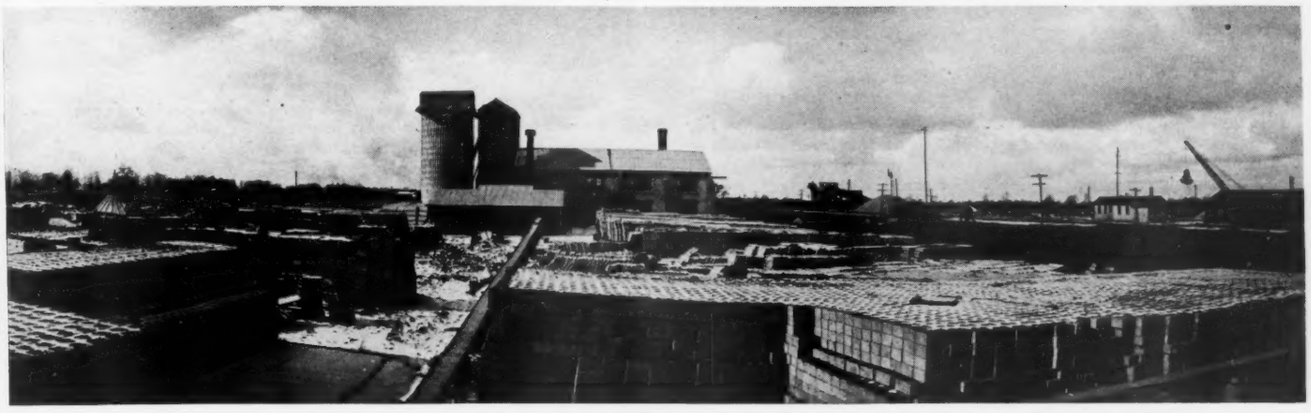
The new owners of the gravel property announced that they would proceed with the development of the carload shipment program from the Indianapolis terminal, build direct railroad connections and add new gravel dredging equipment at an expense of approximately $200,000. The new plant will be established in Raymond street, near the White river, in a part of the 350 acres of gravel land acquired through the deal. Part of the land, which extends along Eagle creek and White river, has not been opened. The corporation takes over the large plants of the Granite company immediately.

Management of the Indianapolis branch of the American Aggregates Corp. will remain in the hands of Willis K. Miller, George V. Miller, general manager, and Fred D. Stiltz, secretary-treasurer, for the time being. These three men and Dr. John F. Barnhill were owners of the Granite Sand and Gravel Co.

W. K. Miller, who has been head of the company since 1916, once offered the artificial lakes created by extraction of gravel at the south edge of the city of Indianapolis for use as a lake part, but the proposition was not accepted. Possibilities of the lakes becoming the source of natural water supply for the city also were discussed, but nothing ever developed. They are more than 125 ft. deep in places and are constantly fed by cold water streams, which flow through a 10-mile square bed of gravel underlying the city. Mr. Miller estimated that it would be impossible to pump them dry. The lakes were suggested as sources for city water supply at a time when water engineers were talking of the possibility that water would have to be brought from Lake Michigan.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE



The plant and storage yard of the Rib-Stone Concrete Corp., located a short distance from Le Roy, N. Y.

Scientific Control Is Emphasized at This Products Plant

Rib-Stone Concrete Corporation, Le Roy, N. Y., Also Uses Limestone for Aggregate Exclusively

THERE was a time when a manufacturer of cement products mixed his cement, water and aggregates with little more precision than that it "looked right" to the mixer man. Fortunately for the users of concrete units—and for the products industry likewise—that time is past and that producer is also out of the picture. Instead we have the various associations working out exact methods, engineers designing mixtures and units, and the producers themselves carrying out experiments in their own plants. In short, science is eliminating guess work.

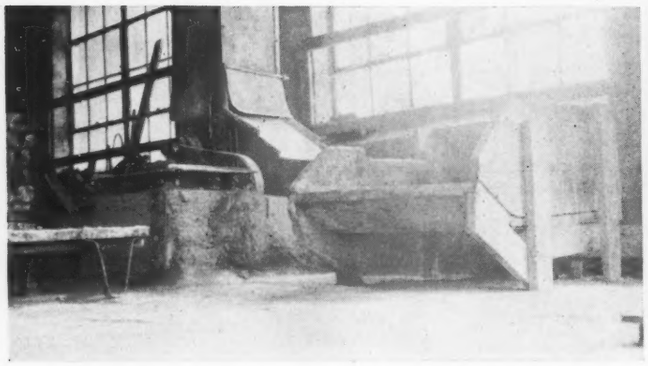
In this new field of specialized designing for special production, one of the leaders of the industry in the east is the Rib-Stone Concrete Corp. of Le Roy, N. Y. This company makes cement silo staves and building tile, and finds a ready market in the rich farming country in western New York state for these products. In the past year or two the demand has also been growing for staves for industrial plants and coal pockets, thus opening up a very advantageous additional field. The company has spent considerable effort in designing its present product, but unquestionably the results justify the work.

The Rib-Stone plant is located a short distance outside of Le Roy, and is adjacent to the property of the Le Roy Lime and Crushed Stone Corp. From this company all of the aggregates used in the products plant are obtained, which in itself is unusual since many producers have claimed that good units could never be made with limestone only. Mr. Priest, the president of the Rib-Stone company, claims that the trouble has not been with the limestone screenings but with the grading, and shows that at his operation the stone is completely separated into distinct sizes and then recombined in the proportions required. By doing this, no difficulty need be encountered, he says.

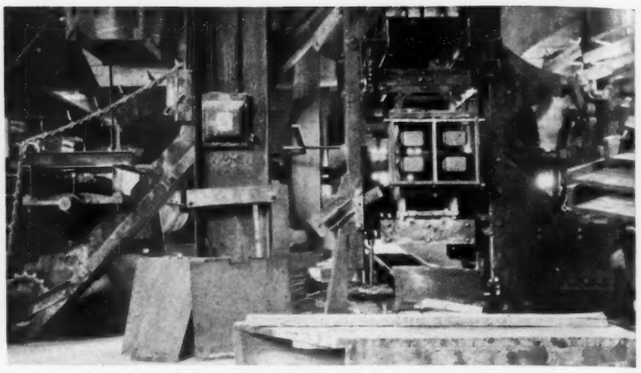
Handling the Material

Screenings are brought by truck to the plant and dumped into a concrete hopper which feeds a belt elevator to the top of the plant. The discharge of this elevator may be carried to either of the two bins at the top of the building, or to the vibrating screens just below the bins, or to the large storage silo for unscreened stone which stands just beside the plant. New material from the Le Roy crushing plant is generally elevated to the silo and stored there, so that the plant will be assured of a constant source of supply, and so the supply will be dry, as wet material would not only affect the screening of the material but would also change the amount of water necessary to add to the mix, which has been carefully worked out by the company. A chute from the base of the silo feeds the same hopper over the belt elevator and thus the dry material is elevated to the "Hum-mer" screen. The two sizes from the screen may be used directly, after reproportioning the two sizes, in the mixer on the floor below or may be elevated to the two bins at the top of the plant. In either case the material is mixed in the chutes, so that it reaches the mixer in the proper proportions. The first bin holds crushed limestone screenings, designated as No. 0, which is used in place of sand, while the second holds limestone passing 5/8-in. mesh, which is known as No. 2.

Directly below the vibrating screen is an Ebeling continuous mixer, fed with cement by a chute from the floor above, and obtaining its other material, as before stated, by



Equipment for making silo staves, showing chute from concrete mixer on floor above, and vibraitng machine for compacting the concrete at the left



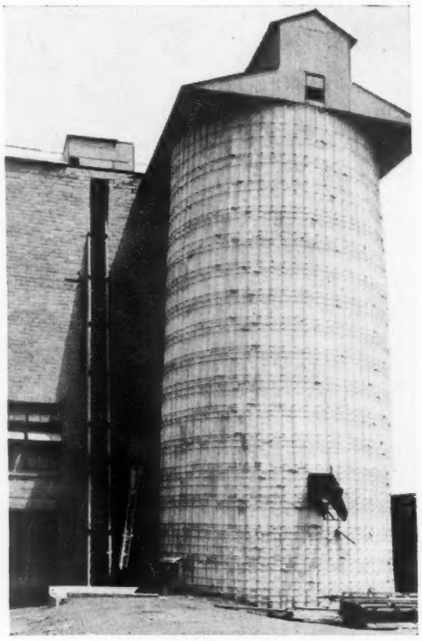
Building tile machine, with inclined elevator from continuous mixer at the left, and end of return conveyor for pallets at the right

a mixing chute from above. This mixer is specially long, with about 80 paddles, which turn the material back two-thirds of the distance it advances forward, so that a complete mix is obtained. There is an Ebeling stripper for making the building tile on the first floor beside the mixer, and the mix is elevated to this by an inclined drag elevator.

Making Silo Staves

The arrangement for the making of staves is entirely separate from the tile layout. It is a complete gravity operation in itself. There is a Koehring 7-cu. ft. "Dandie" mixer on the second floor which receives its aggregate from the storage above. The mix passes down to the first floor, where it is placed in the stave molds, which are then vibrated on a plate vibrating machine, made right at the plant. This works entirely satisfactorily. The filled molds are placed on special wooden racks and carried by lift trucks to the curing rooms. The plant has three of these lift trucks, two made by the Barrett-Craven company and one Cowan Transveyor.

Cement is unloaded directly to the second floor from the cars by a Sheppard "Lift-About," 1-ton hoist. Twenty bags are placed on a woden rack and swung to the second floor, where they are transported to the mixer chutes by lift-trucks. Empty bags are cleaned in a sack cleaner manufactured by the Handy Sack Baler Co. of Cedar Rapids, Iowa. This makes the bags much easier to handle, and at the same time recovers about 1½ lb. of cement per bag, so it is well worth while.



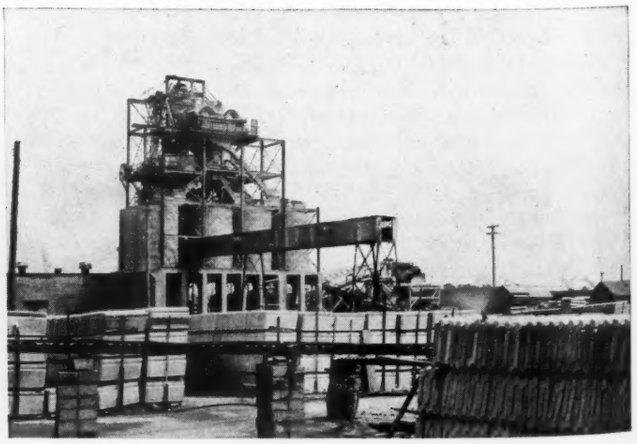
Storage silo built of cull staves appears as strong as one of first-class material

Not only have the proportions for the aggregates been carefully figured, but the amount of water needed is known exactly. For the staves a mushy mix is needed, but only just sufficient water to furnish this mix is added. On the other hand, the tile requires a dry mix, but water is added to this until it has a consistancy which is just dry, providing a workable mix. For the aggregate a fineness modulus of 0.4 is used.

Equipment in Kilns

There are four kilns, each constructed of concrete with an arched roof. Two kilns are for the tiles and two for the staves. The latter have smooth concrete floors for the lift trucks, but the others are fitted with a series of cable conveyors which move the tile from one end of the kiln to the other. These cables are timed when in motion so that they move just 1 ft. during the space it requires to made eight tiles, and as the tiles are placed on special pallets eight high on the conveyor, the men on the machine can keep the conveyor filled all of the time. In the same way it requires just about the same

General view of the products plant taken from the top of the Le Roy Lime and Crushed Stone Corp. plant which is adjacent and furnishes the aggregate



A part of the Rib-Stone company's storage yard and the crushing plant of the Le Roy Lime and Stone Corp. The silos shown are built of Rib-stone products

The Rib-Stone plant, with the kilns to the right, showing the elevator for hauling material beside the silo

The well-planned office building of the company contains a laboratory, a drafting room and show rooms

time to remove the tile at the far end after they have been cured, so that the men removing the tile always have a supply right at hand. When removing the tile they are placed on a gravity, roller conveyor and sent out to the storage yard, sometimes a distance of as much as 380 ft. As the tile are removed from the pallets, the latter are placed on a return conveyor and carried back through an unused portion of one of the kilns right to the stripper. Since the cable conveyors into the kilns start right beside the machine, and the return conveyor brings the empty pallets right back, there is no necessity for a man to move from the machine at all, and this conveyor system has simplified the operation immensely.

However, the most interesting features of the kilns are the thermostatic control and automatic recording system which have been installed. The recording drums show instantly a rise or drop in temperature, and with this control it is easy to keep a uniform heat and consequently a uniform product. The Taylor Instrument Co., Rochester, N. Y., made the instruments for this installation. The heat for the kilns is brought through six steam lines in each kiln, three being on either side. The amount of humidity is regulated from a steam line running through a trough of water on the floor of each kiln, the line being punched at various points to allow the exit of steam. The kilns at night are maintained at a temperature of 125 to 135 deg. F. Mr. Priest stated that before this system was inaugurated they were considerably bothered by curing checks in their products, but that the trouble had been entirely eliminated with these temperature controls. This record appears exceptional when it is considered that the company's products are half of a very mushy consistancy and half dry tamped. Curing in the kilns in summer generally occupies 24 hours, while in winter the period is 48 hours. The plant has been running straight through the winter months during the past two years. With these controls the company now has an accurate and scientific check on its whole process, controlling the fineness modulus of the aggregates, the amount of cement, amount of water and the curing conditions.

The staves which the Rib-Stone corporation manufactures are those of the Playford patents. These are a single rib stave with wire-mesh reinforcement. The reinforcement covers the whole stave in units for coal pockets and bins, but for farm silos it only covers half the area, since not the same strength is required. The rib overlaps the back of the next stave when placed in position in a structure, and the binding irons passing around the structure touch the stave only on the back of the rib. Each rib acts as a beam, supported on the binding irons at each end, and on this reinforced beam the weight of the contents of the structure presses. At the time the plant was visited, Mr. Priest had developed a new cast-iron mold for these staves, with essentially the same design, but with several new features. The great advantage of the iron mold instead of the sheet steel mold, that is at present being used, is that it can never get out of shape as a sheet steel mold will, and thus a uniform product is always assured.

This plant with seven men at work will turn out approximately 8200 tile 5x8x12-in. in size, or twice as many tile 5x4x12-in. in one day. Tile and staves are not made at the same time, and when staves are being manufactured about 550 are turned out in a day. The products are all light colored because of the whiteness of the aggregate, giving a very pleasing appearance. A good grade of gray cement is used.

A Use for Cull Staves

The Rib-Stone croporation is nine years old, and the present plant was constructed five years ago. It is of fireproof construction throughout, being entirely of concrete and steel. Beside the plant is the silo for material which was constructed four years ago of cull staves, which were not sold because of some imperfections in their construction. This silo to all appearance looks as well and is as strong as a silo of the best staves, except there is a slight irregularity in the contour due to the ends of the staves not being true. Mr. Priest uses this silo as a strong selling argument, pointing out that if a silo of second rate staves can hold 1000 tons of limestone screenings without anv trouble or failing, a silo of first rate staves shall be strong enough for every ordinary purpose.

On the second floor of the plant is a woodworking shop, in which the construction forms and wooden portions of the silos are made. There is also a very attractive office building of two floors and a basement, which was built almost entirely of products from the plant. Beside the company offices, this building is to have an experimental laboratory in the basement and a complete drafting room on the second floor. There is to be a show room for displaying the company's products, the walls of which are done in panels of different colors and textures of cement finishes which the company also handles.

George E. Priest is president of the Rib-Stone Concrete Corp. and J. L. Heimlich is vice-president. The treasurer is Donald Woodward, and Pauline E. Priest is the secretary.

National Gypsum Company Announces New Product

THE National Gypsum Co., Buffalo, N. Y., announces that "National Gold Bond Tile Board, the first gypsum tile board ever perfected," is now ready for the trade. Among the advantages claimed for this new tile board are: Solid as a rock—it is rock; cannot warp from steam-filled air of bathroom or kitchen; fireproof; sheds water, when finished, like a ceramic tile; is supplied unfinished and can be enameled or painted any color to suit the owner. The new product is declared to be particularly adaptable to the home modernization movement now spreading throughout the country, the announcement saying on that subject: "For every new home there are thousands of old houses already built which must be lived in. For every new hotel or restaurant built there are hundreds of old ones. 'Gold Bond Solid Tile Board' opens up a limitless field for business on these old structures. Nothing can so transform an old bathroom or kitchen as tiling the walls, and the low cost gives a permanent solid job at a price within the reach of everyone." The National Gypsum Co. has plants near Buffalo, N. Y., and in Michigan.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Mo.	.50@ .75	1.35@1.45	1.15@1.25	1.10@1.20	1.05@1.15	1.05@1.10
Ft. Spring, W. Va.	.40	1.35	1.30	1.25	1.15	1.05
Munns, N. Y.	.75	1.10	1.10	1.00	1.00	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.75	1.35	1.15	.95	.85	1.35
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.....	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	1.05@1.40	.95@1.50	1.15@1.50	1.05@1.50	1.05@1.50	.....
Cypress, Ill.	1.00@1.25	1.00@1.25	1.20@1.25	1.20@1.25	1.20@1.25	1.35
Davenport, Iowa	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.85	1.00	1.25	1.25	1.25	1.25
Stolle and Falling Springs, Ill.	1.05@1.40	.95@1.50	1.15@1.50	1.05@1.50	1.05@1.50	.....
Greencastle, Ind.	1.25	1.05	1.05	1.05	.95	.95
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Northern Ohio Points	.85@1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.20	1.10	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	1.10	1.10	1.10	1.10	.90
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.45	1.15	.....
Chico, Texas	1.00	1.30	1.25	1.20	1.10	1.05
Cutler, Fla.	.40r@ .75r	.....	.....	1.75r	.....	1.10r
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Olive Hill, Ky.	.....	1.00@1.10	.90@1.00	.90@1.00	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	.....	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.00	1.25	1.00@1.25	.90@1.25	.90@1.25	.90@1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

(r) Cubic yard.

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meridan, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.40@1.45	2.10	1.90	1.40@1.50	1.40@1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.50@ .75	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Springfield, N. J.	1.45	2.10	2.00	1.60	1.60	.....
Toronto, Canada (m)	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.80	1.80	1.65	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	1.75b	1.75	1.40	1.35	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.	.40	.....	1.35	1.30	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .85. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yd.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh.. 6.00

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh.. 1.00

Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh..... 5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh..... 1.50

Cartersville, Ga.—50% thru 50 mesh.... 1.50

Pulverized, per ton..... 2.00

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk..... 2.50

Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; 50-90% thru 4 mesh.. 1.25
50-90% thru 100 mesh..... 1.35

Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk..... 3.50
Paper bags 4.75
100 lb. cloth bags..... 5.25

(All prices less .25 cash 15 days)

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton..... 6.00
90% thru 20 mesh, bulk, per ton..... 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked..... 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95

Bulk 2.70

Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags 4.25

Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh, 3.50; 50% thru 100 mesh, 2.50; 90% thru 30 mesh..... 2.00

Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk..... 2.70

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk..... 1.75

Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk 2.25

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton..... 2.90

Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh; bulk, 4.00; paper bags..... 5.00

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk..... 1.35@ 1.60

Olive Hill, Ky.—90% thru 4 mesh..... 1.00
90% thru 100 mesh..... 2.00

Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100..... 2.50

100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk..... 3.50

100% thru 4, 30% thru 100, bulk..... 1.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk 2.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 95% thru 10 mesh..... 1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh 1.50

Davenport, Ia.—Analysis, 97% $CaCO_3$: 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25
90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—50% thru 4 mesh ..... .85

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh 1.00

Kansas City, Mo. — 50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .90

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh ..... 1.10@1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 90% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.05

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh .... 1.10@1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00

Hillsville, Penn., sacks, 4.50; bulk 3.00

Joliet, Ill. — Analysis, 52% $CaCO_3$; 46% $MgCO_3$; 90% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio, sacks, 4.50@5.00; bulk .. 3.00@ 3.50

Rocky Point, Va.—85% thru 200 mesh, bulk ..... 2.25@ 3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. ..... *1.75@ 2.25
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30@ .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
Rockwood, Mich. ..... 2.25@ 3.00
San Francisco, Calif. ..... 4.00@ 5.00
Silica and Mendota, Va. 2.00
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. ..... .75@ 1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	
Estill Springs and Sewanee, Tenn.	1.35@1.50	1.35@1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.25
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.		.55	1.10	1.25	1.40	
Attica and Franklinville, N. Y.	.65	.65	.65	.65	.65	.65
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	.95	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.80			1.40	
Leeds Junction, Me.	1.00	1.00	2.50		2.25	
Machias Jct., N. Y.	.85	.75	.75		.75	.75
Montoursville, Penn.	1.00	.75	.70	.60	.60	.50
Northern New Jersey	.60	.60		1.25	1.25	
Somerset, Penn.		2.00				
Troy, N. Y.	.50@ .75*	.50@ .75*	.80@1.00*	.80@1.00*		.80@1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.30*	.20*	.40*	.45*	.50*	.50*
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40	.60	.65	.65	.65
Chicago, Ill.	.50	.50@1.45†	.60	.60@1.55†	.60	.60@1.90†
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio¶	.65	.65	.65	.65		
Des Moines, Iowa		.40	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.		.40	.55@ .75	.85	.85	
Elkhart Lake, Wis.	.60	.30	.50	.56	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50		.60	.80	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25e
Mason City, Iowa	.50	.50	1.25	1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.15@ .25	.15@ .25	.75@1.00	.75@1.00	1.00@1.25	1.00@1.25
St. Louis, Mo.	1.15e	1.45f	1.45a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.85	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
SOUTHERN:						
Brewster, Fla.	.50	.50	3.00	3.00		
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.45				
Fort Worth, Texas		.75@1.25	1.00@1.10	1.00@1.25	1.00@1.35	1.00@1.35
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.	.65@ .90	.65@ .90	2.25@2.50	2.25@2.50	2.25@2.50	2.25@2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.35	.15	.85	.85	.75	.75
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.		.35@ .50	.50@ .60	.50@ .60	.50@ .60	.50@ .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.25*	1.15*	1.10*
Pueblo, Colo.	.80	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.	.75*		1.30	1.10	1.00	1.00
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa				.60		
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Fls., Wis					.65	
Fort Worth, Texas						.55@ .80
Gainesville, Texas						.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅜-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in. (j) Lake sand, 1.75, delivered. (k) 60-70% crushed boulders. †Cu. yd., f.o.b. cars, Chicago. (m) Cu. yd., dune sand, f.o.b. cars, Chicago.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25			3.75	
Beach City, Ohio	1.50@2.00	1.75@2.00		1.50	1.50@1.75		1.50
Dresden, Ohio	1.25@1.50	1.25@1.50	1.50@1.75	1.00@1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75	2.00	1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.50	2.50		
Michigan City, Ind.				.30@ .35			
Montoursville, Penn.				1.35@1.60			
New Lexington, O.	2.00	1.25					
Ohlton, Ohio	2.00	2.00		1.75	1.75	1.75	
Ottawa, Ill.	1.00	1.25	1.50	1.75	1.25	3.50	2.00
Red Wing, Minn.(d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Mendota, Va.	Potters flint, 8.00@10.00g						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*@2.00h	2.00h		1.50*@2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, $3.00@4.25. (f) Crude and dry. (g) Also 12.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point EASTERN:	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.00			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.90
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

EASTERN:	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.	10.00@11.00	8.50@9.00	8.50@9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[9]
CENTRAL:								
Afton, Mich.					7.50			1.35
Carey, Ohio	11.50	7.50	7.50		8.00		8.00	1.50
Cold Springs, Ohio		8.00	7.50				8.00	
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	12.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50	8.25	.62½	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[9]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00@9.50	8.00@9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00					7.00	1.35
Keystone, Ala.	19.00	9.00	9.00	10.00			7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala, Fla.		10.00	9.00				10.00	1.40
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	16.00	12.50	16.00@19.50	14.50	.90[17]	14.50	1.85[17]
Tehachapi, Calif.[13]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9]80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [22] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc (for grinding) 4.00@50.00
- Ground talc (20-50 mesh), bags 8.00
- Ground talc (150-200 mesh), bags 8.50@15.50
- Pencils and steel crayons, gross 1.00@ 2.00

Chester, Vt.:
- Ground talc (150-200 mesh), paper bags 9.00@10.00
- Same, burlap bags, bags extra 8.00@ 9.00

Chicago and Joliet, Ill.:
- Ground (150-200 mesh), bags 30.00

Cromleys Mt., Md.:
- Crude talc 63.00

Dalton, Ga.:
- Crude talc (for grinding) 5.00
- Ground talc (150-200 mesh), bags 12.00
- Pencils and steel worker's crayons, per gross 1.00@ 2.50

Emeryville, N. Y.:
(Double air floated) including bags;
- 325 mesh 14.75
- 200 mesh 13.75

Hailesboro, N. Y.:
- Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh 15.50@20.00

Henry, Va.:
- Crude (mine run) 3.50@ 4.00
- Ground talc (150-200 mesh), bags 9.50@14.00

Joliet, Ill.:
Ground talc (200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 10.00

Keeler, Calif.:
- Ground (200-300 mesh), bags 20.00@30.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Columbia, Tenn.—B.P.L. 65-70% 3.50@ 4.50
- Gordonsburg, Tenn.—B.P.L. 65-70% 3.75@ 4.00
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72% 5.00
- B.P.L. 75% 6.00
- Twomey, Tenn.—B.P.L. 65%, 2000 lb. 8.00@ 9.00

Ground Rock

(2000 lb.)

- Centerville, Tenn.—B.P.L. 65% 8.00
- Gordonsburg, Tenn.—B.P.L. 65-70% 3.75@ 4.50
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Twomey, Tenn.—B.P.L. 65% 8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

- Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68% 3.25
- 70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

- Pringle, S. D.—Mine run, per ton 125.00
- Punch mica, per lb. .06
- Scrap, per ton, carloads 20.00
- Rumney Depot, N. H.—Per ton,
  - Mine run 300.00
  - Clean shop scrap 25.00
  - Mine scrap 22.50@24.00
  - Roofing mica 37.50
  - Punch mica, per lb. .12

Cut mica—50% from Standard List.

Rock Products

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	¶12.50@‖14.50	¶12.50@‖14.50
Brighton, Tenn.—Pink marble chips	$3.00	$3.00
Crown Point, N. Y.—Mica spar		9.00@10.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.		8.00@ 9.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		11.00@18.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	¶9.00@‖10.00	¶9.00@‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.—Royal green granite		16.00@20.00a
Randville, Mich.—Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		16.00@20.00
Tuckahoe, N. Y.—Tuckahoe white	10.00	
Warren, N. H.		¶7.90@‖8.95
Wauwatosa, Wis.		20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 16.00.
‡Bulk, car lots, minimum 30 tons.
¶C.L. ‖L.C.L. (a) Including bags.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6%; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50@14.00; bulk	11.00@12.50
Pulverized, 95% thru 200 mesh; bags, 19.73@23.50; bulk	15.75@22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99¼% thru 200 mesh; bulk	18.00
(Bags 15c extra.) Crude feldspar, bulk	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone)	‡7.50@*9.00
Davenport, Ia.—(Limestone) bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, $8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.00@12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	16.00
Pontiac, Mich.	12.50@15.00*
Pontiac, Mich.	12.00
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50@14.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada (f)	†15.00*
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M. 10th of month. (d) 5% disc., 10th of month. (e) Delivered in city limits. (f) F.o.b. yard, 12.50.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.		3.70
Atlanta, Ga.		2.35
Baltimore, Md.		2.25@2.65
Birmingham, Ala.		2.10
Boston, Mass.	.68¼	2.23@2.73
Buffalo, N. Y.	.62½	2.00@2.50
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.64	2.56
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.22
Denver, Colo.	.63¾	2.55
Des Moines, Iowa		2.05
Detroit, Mich.		1.95
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.04
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.13@2.53
Kansas City, Mo.		1.92
Los Angeles, Calif.	.62½	2.50
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.04
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.60
New Orleans, La.		2.07
New York, N. Y.	.60¾	1.93@2.43
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11@2.61
Phoenix, Ariz.		3.91*
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.	.60	2.40
Reno, Nev.		2.91
Richmond, Va.		2.40@2.80
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.21
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.65
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.29

Mill prices f.o.b. in carload lots, without bags to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Bellingham, Wash.		2.10
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.05
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.65
Lime and Oswego, Ore.		2.50‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks. ‡10c discount, 15 days. †10c discount 10 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	.....	.....	.....	.....	.....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	10.00	.....	.....	11.70u	.....	.....	.....
Blue Rapids, Kan.	1.70	4.00	.....	.....	.....	.....	13.50	.....	.....	.....	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	12.00	24.00	13.50	.....	15.00	20.00
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	m9.00@11.00o	.....	22.00	18.00	21.00	.....
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30 m	.....	7.25	.....	.....	.....	.....	30.00
Delawanna, N. J.	.....	.....	.....	.....	.....	.....	18.00	.....	30.00	.....	13.00	14.00	.....
Douglas, Ariz.	.....	.....	.....	.....	15.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	1.70	4.00	6.00	14.50	9.00	9.50	17.65	.....	22.75	19.00	.....	15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	19.00	7.00	24.50	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70@3.00	4.00	6.00	6.00	9.00	9.00	.....	.....	.....	19.00	.....	15.00	20.00@25.00
Los Angeles, Calif.	5.00	7.50m	7.50m	7.00@9.00	11.00m	9.00	21.00	7.00	15.00	11.00m	.....	15.00	27.50v
Medicine Lodge, Kan.	1.70	4.00	6.00	8.00o	.....	.....	.....	.....	30.15	20.00	.....	15.00	20.00
Port Clinton, Ohio	3.00	4.00	.....	.....	.....	.....	15.40	.....	.....	.....	.....	20.00	30.00
Portland, Colo.	.....	.....	6.00	10.00	9.00	9.00	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Seattle, Wash. (b)	6.00	10.00	9.00	13.40	14.40	.....	.....	.....	.....	.....	.....	.....	.....
Signal, Utah	.....	.....	10.00	13.00	.....	.....	15.40	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.00	7.00	13.00	14.00	14.00	.....	.....	21.50	.....	.....	.....	.....
							.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing, molding, 14.00.
(b) Calacoustic plaster 10.00 at mill; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks. (v) retail 35.00.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Chicago District¶	180.00@210.00a	230.00@260.00a	280.00@330.00a
Columbus, Ohio	16.00	.....	.....
Detroit, Mich.	.15@ .17†	.....	.24@.26†
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind.	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per M	130.00
8x 8x16, per M	200.00
8x12x16, per M	275.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	8.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y..	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
	Each
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per M:	
3 in.	40.00
4 in.	50.00
6 in.	75.00
8 in.	100.00
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Chicago District	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex. — Clinker	13.00	13.00
Ensley, Ala. ("Slagtex")	9.00@12.00	.....
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00@ 23.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	16.50
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	18.00	30.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.95	.....	1.27	.....	.....	2.01	.....	2.73	3.78	4.58	6.24	7.19	8.11
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.90	7.78

(a) 24-in. lengths. (b) Reinforced. (c) Delivered on job; 5% discount, 10th of month. †21-in. diam. ‡Price per 2-ft. length.

New Silica Company Formed at Sedro-Woolley, Wash.

SILICA deposits in the Skagit valley in Washington are to be developed within a short time by the H. P. Scheel Eversharp Pulp Burr Co. of Sedro-Woolley, Wash., which was recently incorporated for $125,000. The company owns a big deposit of silica about 13 miles east of Rockport, Wash., near the Seattle railroad, which is said to be the only deposit of silica found west of the Cascade mountains. Development work at this deposit has been under way for several years.

The primary object of the new company will be to manufacture the pulp burr, a wheel made from silica which is used in grinding wood pulp. This type of pulp burr is an invention of Mr. Scheel and is said to be harder than any grinder now in use in pulp plants. In addition to this product, the company will produce a large variety of silica products, for which there is a good market. Another product expected to be placed on the market is art stone used for building.

The company has leased the plant of the Washington Agricultural Chemical Co. in Sedro-Woolley and is altering the plant in preparation for grinding silica and manufacturing silica products of various kinds.

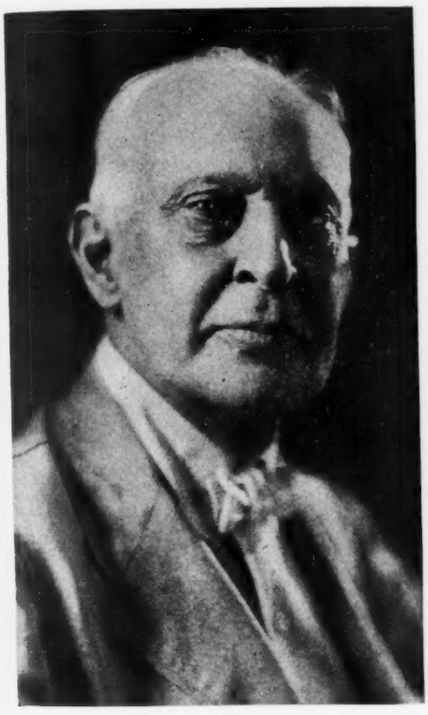
Talc Deposits To Be Developed Near Grangeville, Idaho

A NEW development in the rock products field is promised by the recent incorporation of the Garner Electric Range Co. of Spokane, Wash., which, beside the manufacture of electric stoves, will also operate a talc mine near Pollack, Idaho. A good portion of the production of the new mine is to go towards the manufacture of the electric ranges, as talc is a necessary feature in their construction, but it is expected that some of the output will be sold commercially. The company has been incorporated for $1,000,000 and W. C. Garner is its present head.

It is claimed that the present development contains unlimited amounts of the best quality talc. At present the talc will be trucked from the mine on the Little Salmon river to Grangeville, Idaho, where it will be loaded on to cars for shipment.

George Newcomer Retires from F. L. Smidth & Co.

ANNOUNCEMENT has been made by F. L. Smidth and Co., engineers for cement mills and equipment, New York City, of the retirement of George M. Newcomer, first vice-president of the company. Mr. Newcomer first joined the organization at its inception in November, 1895, and since that time has witnessed the remarkable



George M. Newcomer

changes which have taken place in the cement industry of the world, as one of the oldest men in point of service in the field. He originally became identified with the cement industry in 1893 when he became sales agent for the Aalborg Cement Co. of Denmark. In 1895 he co-operated in forming the American corporation of the F. L. Smidth Co., and has acted as active head of that corporation for many years.

The company has also announced the election of Harold Osterberg as vice-president. Mr. Osterberg has been in the service of the European company of F. L. Smidth for approximately 20 years, and lately has been manager of the French and Belgian business of that concern. He will take up the duties of the management of the American company together with the other two vice-presidents, P. T. Lindhard and G. Larson.

New Appointments of Universal Portland Cement Co.

ANNOUNCEMENT is made by the Universal Portland Cement Co., Chicago, Ill., of the following new appointments: A. C. Cronkrite, assistant general sales manager; Edward Quebbeman, western sales manager; W. L. Greenly, division sales manager for Chicago; Harry A. Craig, division sales manager for Illinois and Missouri; Earle D. McKay, division sales manager at Duluth.

It is interesting to note that all of the executives mentioned have been with the company for a long period of time. Mr. Cronkrite has been with Universal for more than 20 years, and prior to his appointment as assistant general sales manager was division sales manager for the Chicago territory. Edward Quebbeman, the new western sales manager, is a recipient of the Judge Gary medal for valuable and long-time service. Starting as an office boy to B. F. Affleck, now president of the Universal company, in 1896, he has held various positions with the company, and at the time of his appointment was division sales manager for Illinois and Missouri. W. L. Greenly has been with the company for 18 years, having been in charge of sales in the Dakotas, Montana and more recently the Duluth district. Harry A. Craig has been with the company since 1912, and Earle D. McKay has been field engineer for the service bureau of the company since 1920.

To Double Capacity of Trinity Portland's Ft. Worth Mill

PLANS have been adopted by the Trinity Portland Cement Co. of Dallas, Texas, for the construction of an addition to its plant at Ft. Worth, Texas, which will double the capacity, according to W. H. L. McCourtie, vice-president of the company. The proposed improvement will cost $500,000 and it will require about six months to complete, it was stated. Consistent growth of Ft. Worth and other west Texas cities which are using most of the company's product was assigned as the reason for the necessity for a larger plant.

It is proposed to erect a new kiln which will measure 11x250 ft. The new grinding mills will be 8x30 ft. and will be installed with other new equipment, including new large motors. The addition, more than doubling the capacity of the plant, will permit the maximum production to reach 3500 bbl. of cement daily. The improvements will make the Ft. Worth plant of the company one of the largest, if not of the largest, producer of cement in the southwest. The plant already represents an expenditure of more than $1,500,000. Parts of the present plant were so constructed as to take care of the additions which are now to be made.

"Demand for cement is a good indication of community prosperity," Mr. McCourtie said. "Cement construction in business buildings and concrete highways show a prosperous trend and shows that the cities are building for the years to come. If the demand for cement was abnormal, the Trinity Portland Cement Co. would not be contemplating such an expansive program of improvements. On the other hand, the demand has been consistent and indications are that the public will be waiting for the doubled output as soon as we are able to make it."

J. S. Bond Leaves Allis-Chalmers Manufacturing Co.

J. S. BOND, well known throughout the country in the rock products industry, has requested and been granted a leave of absence from the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., taking effect September 1, 1928, and will spend the balance of the summer at his lodge in northern Wisconsin, but will continue his permanent residence in Milwaukee.

Mr. Bond entered into the activities of this industry originally with the Frazer and Chalmers Co., Chicago, in 1895, and con-

J. S. Bond

tinued his connection after the consolidation with the Allis-Chalmers Manufacturing Co. in 1901. He remained with that organization until 1904, at which time he joined the Power and Mining Machinery Co., Cudahy, Wis., which later was taken over by the Worthington Pump and Machinery Corp. At the time this works was absorbed by the Allis-Chalmers Manufacturing Co., in 1924, he was sales manager of the mining, crushing and cement machinery departments of the Worthington company.

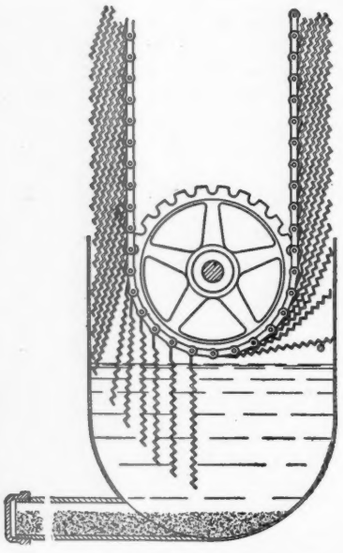
Mr. Bond played an important part in the growth and development of equipment for stone-crushing and cement plants, having taken special interest in this particular machinery. It is but natural that during this period of time, which covers a good portion of the life of these industries, that he has made many friends, and a considerable number of them has developed from a very small plant owner to one of the leading operators of the present day.

New Machinery and Equipment

Self-Cleaning Air Filter for Engines and Compressors

THE Reed Air Filter Co., Louisville, Ky., has announced a new automatic air filter for oil engines, air compressors, and similar installations requiring pure air. Special attention has been given to reinforcing the filter to withstand the severe pulsations of this kind of service, the company's announcement states. In this new device, the filtering medium consists of a continuous curtain of double woven-wire panels overlapping six deep, like shingles on a roof. These panels are carried between ¼-in. rods extending the full width of the filter and spaced 1⅜ in. apart, forming a substantial reinforcement for the media. The air is forced to pass twice through six double panels and thus 24 impingements are secured. Because of this the company claims a cleaning efficiency for its filter of 97% to 98%.

New air filter for engines and compessors



Cross-section of new air filter, showing how the filtering screens are cleaned in a bath of oil

Just before reaching the cleaning tank at the bottom of the filter casing, the panels are automatically separated and are individually plunged down into and through the filter oil. The separation of the panels loosens the dust deposits and the force with which the panels strike and pass through the oil washes them completely clean, it is claimed, before they are automatically reassembled for the next circuit. The entire operation is automatic, and it is stated that no personal attention nor manual cleaning or charging is required.

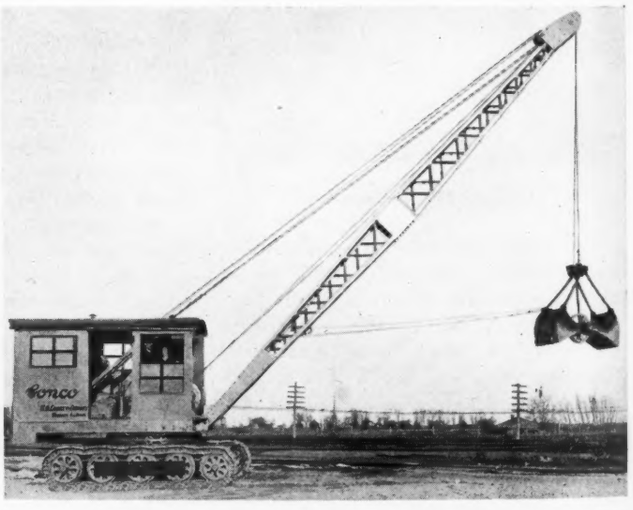
It is claimed that the unit is practically wearproof, due to the use of anti-friction bearings and to the fact that the media moves only ¾ in. in 12 minutes. The unit, which is made for capacities of 2800 c.f.m. to 20,000 c.f.m., is small and compact, and is easy to install, it is stated.

New Crawler Type Crane

H. D. CONKEY AND CO., Mendota, Ill., have recently placed on the market a new crawler crane which is known as the "Conco Crawler." The new unit is a self-contained, full-circle machine, running on the company's improved endless-tread, it is stated. It was primarily designed for a rapid material handling unit for grab bucket, dragline or hook-block work, and is strictly a one-man machine, the announcement states. Raising and lowering the boom, swinging, traveling and steering are all accomplished from the operator's deck. Vertical swing and travel shaft bearings are oiled from large cups located in the cab. Alemite system is used where oil cups cannot be attached. The traveling gear is arranged for two speeds under control of the operator regardless of the position of the turntable. The swing brake is of such design that the turntable or machinery deck may be set in any position with relation to the car body, according to the announcement.

The Conkey company states that the outstanding points of this crane are its low center of gravity, ease of operation, speed, ruggedness of construction, low power loss, absence of friction clutches and low maintenance cost. A special feature is the patented method of engaging the hoisting and holding drums by use of a ball thrust bearing in connection with a special thrust nut, providing an effective means of operation and eliminating thrust screws, washers, springs and cams. It is claimed that this feature provides an extremely smooth-working operation.

The crane is being built in ½-yd., ¾-yd. and 1-yd. sizes at the present time. It is made for either gasoline or electric operation.

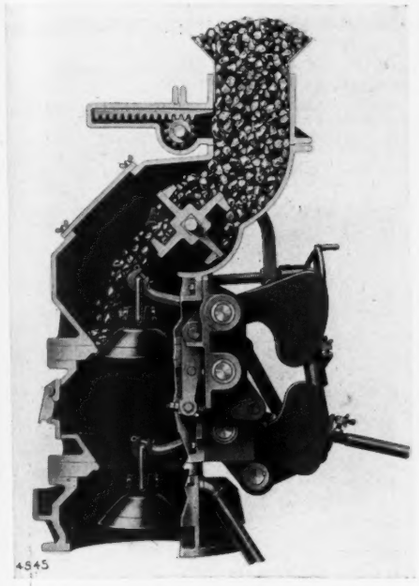


New fully-convertible crawler-type crane

New Type of Fuel Feed for Gas Producers

WELLMAN-SEAVER-MORGAN CO., Cleveland, Ohio, has brought out a new type of fuel feed for mechanical gas producers which should have application in the rock products field. It is a double-bell type of feed which operates on a principle different from that used in the revolving pocketed vane-wheel type of feed. In this feed, two bells, which automatically lower and rise alternately, pass the fuel into the producer, their action being so timed that one bell is open when the other is closed. The operation of the bells requires but a fraction of 1 hp., it is claimed, which is supplied by the producer motor. The rate of feeding is regulated by a rotating fingered vane-wheel above the upper bell, and there is a shut-off valve at the top to stop the flow completely. The bells are of alloy steel, machined to insure gas-tightness, it is stated.

Any granular fuel in sizes up to 3 in. may be used. The use of the feed assures an even distribution of the fuel, it is claimed. The volatile constituents are quickly gasefied and



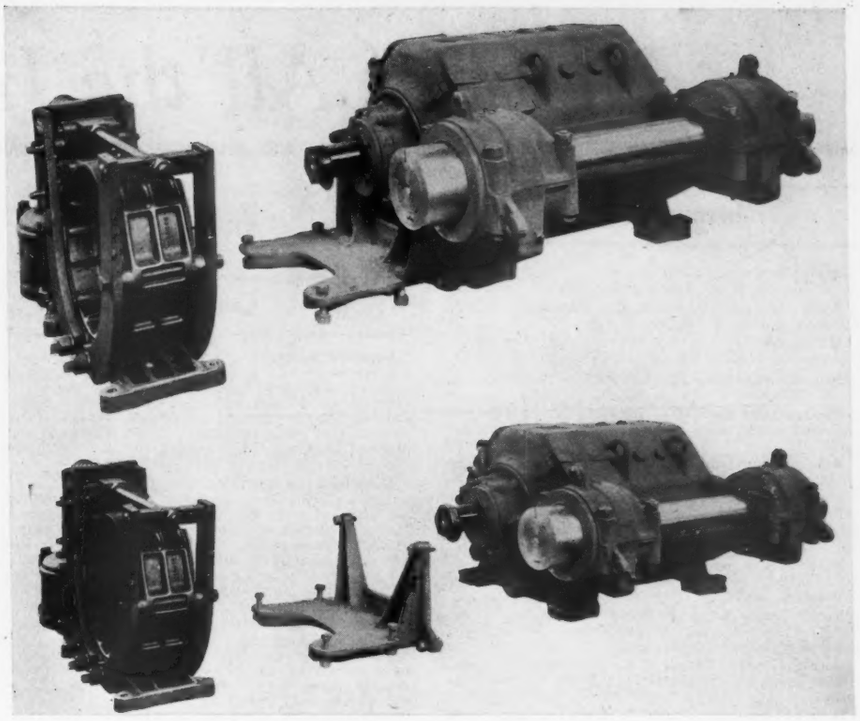
New mechanical double-bell fuel feed

an incandescent bed of coke is maintained for the reception of fresh fuel.

The feed is made in two sizes, the smaller having a capacity up to 5000 lb. per hour and the larger with a capacity of twice that amount. It has been adopted as standard equipment on Wellman-Seaver-Morgan Type L producers, and is interchangeable with previous types supplied with the Hughes type of producers.

New Solenoid Brakes

GENERAL ELECTRIC CO., Schenectady, N. Y., has brought out a complete new line of solenoid brakes in which simplification has been stressed. The new line is designated CR-9516, and includes brakes for operation on both alternating and direct current. The construction involves the use of a spring setting device, which is claimed to be a new feature for a.c. applications. The



Mill-type motor with solenoid brake and mounting bracket

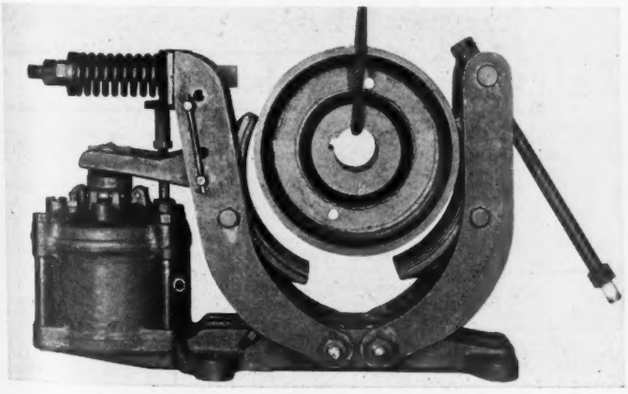
announcement follows developmental work over a period of years.

The brakes are especially designed for severe service in connection with mill, crane and hoist motors. The manufacturer claims smooth operation for making quick stops in either direction of rotation, with a dependable holding value. The brake mechanism is held in the "off" position by a coil and plunger; when power is applied to the motor the coil is energized and the brake is released, and, when the power is shut off, the spring setting device forces the mechanism into the closed or braking position.

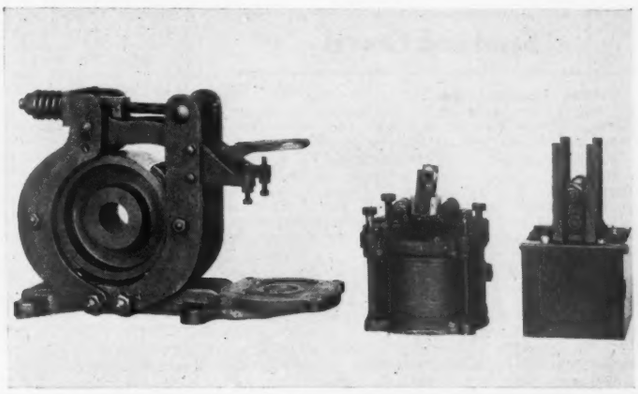
Both a.c. and d.c. brakes use the same brake mechanism and frame, the solenoids being interchangeable. Further flexibility is obtained by making the floor-mounted brake the basic unit of the line; by adding a mounting bracket it becomes a motor-mounted brake. The brakes, being spring-set, can be mounted in any position, it is claimed, and have adjustable torque, allow no sudden jar from falling armature and have a simple overhead lever construction.

Exceptionally small diameter brake wheels are used, minimizing flywheel effect and reducing WR^2 values. A wide wheel face gives ample braking surface, the manufacturers claim. The brake shoes are of cast iron and are self-aligning, permitting proper contact with the wheel even when the brake is incorrectly mounted and the wheel is out of line with the center line of the brake both sidewise and up or down, it is claimed. Compressed, woven asbestos lining furnishes the braking surface for the shoes.

The brake yokes of plate steel are pivoted below the wheel near the center line and cover the rim on both sides of the wheel so that it cannot come off the shaft accidentally, the manufacturers claim.



Method of removing wheel from typical solenoid brake



Solenoid brake with interchangeable d.c. and a.c. solenoids

News of All the Industry

Incorporations

Myrckle Cement Co., Norman, Okla., $25,000. C. A. Bowles, T. K. Davis and Charles S. Standley.

Ruth Concrete Products Co., Vineland, N. J., $10,000. Edwin F. Miller.

Milwaukee Duntile Co., Shorewood, Wis., $15,000. W. J. Hayes, W. G. Dorward and G. Carroll.

Mamoroneck Sand and Gravel Co., Mamoroneck, N. Y., $10,000.

Co-Operative Sand Co., Newark, N. J., $100,000 preferred stock; 2500 shares common stock, no par value.

Bayou Sand and Gravel Co., Houston, Tex., 500,000 shares, no par value. C. O. Woolsey, L. B. Jones and Freda M. Jones.

Transit Concrete Corp., New York, N. Y., 1000 shares common stock. J. I. Goodstein, correspondent, 21 E. 40th St.

Penn Supply and Material Co., Camden, N. J. 5,000 shares, no par value. To produce and deal in builders' supplies.

North Jersey Sand & Stone Co., Spring Lake. N. J. 15,000 shares, no par value. To produce and deal in building materials.

Forest County Gravel Co., Hattiesburg, Miss., $100,000. N. W. Rockett, 1120 Main St., Hattiesburg.

Morris Limestone Products Co., Chicago, 5000 shares, no par value. Paul M. Schroter, 120 S. La Salle St., Chicago, H. W. Binnie, F. H. Shaw.

Nustone Products Corp. of Connecticut, New Haven. Conn., $50,000. M. M. Mogil, 478 Whalley Ave., New Haven, and others.

M. and M. Sand and Gravel Co., Waynoka and Enid, Okla., $10,000. G. W. Monahan, Henry C. Messman and L. F. Messman.

Interstate Cement Corp., Wilmington, Del., 5000 shares, no par value. To produce and deal in cement, rock, limestone and similar products.

Wagaraw Block Co., Fairlawn, N. J., 2500 shares, no par value. Stuart Inglis, 633 E. 23rd St., Paterson, N. J., Le Roy Vert and Mort Inglis. To manufacture cement blocks and other products.

S. B. Lawrence Co., Inc., Lancaster, Penn. To manufacture concrete blocks and specialties. S. B. Lawrence, H. H. Lawrence and E. M. Lawrence. The company has obtained a plant site at Rossmere.

Quarries

Wisconsin Stone and Duntile Co., Howard, Wis., has leased the Brunette quarry and is getting it ready for operation. Forty feet of water in the quarry is being pumped out, new motors have been installed, an air compressor has been purchased, and the sizing screens have arrived.

Green Spring Valley, Md. Plans for the opening of a quarry here have been abandoned by Thomas B. Gatch & Sons, quarrymen, due to the protest of people of the neighborhood. It is expected that the property acquired by the Gatch company will be purchased by a group of residents of the valley, to prevent its use as a quarry.

Sand and Gravel

Denton Sand and Gravel Co., Pacific, Mo., has adopted group insurance for the benefit of its employes. The policies cover health and non-occupational periods, as well as $50,000 of life insurance.

P. W. Bradford, Great Falls, Mont., is building a sand and gravel screening plant on the Great Northern R. R. right-of-way in Great Falls. The Great Northern is installing 2000 ft. of track at Sun River to serve Mr. Bradford's pit at that point. The material will be brought to Great Falls to be washed and screened.

Southern California Rock Products Association, Los Angeles, has adopted a resolution requiring bunker men at material producing and handling plants of companies belonging to the association to trim each truckload before it leaves the plant, so that the nuisance of rock and sand dropped on streets and roads will be eliminated.

Kickapoo Sand and Gravel Co., Peru, Ind., has had the lake at its gravel pit in West Peru stocked with game fish under the supervision of the state department of conservation. Paul Stewart, manager of the company, who was instrumental in having the stocking done, says the lake will be used as a fish preserve.

Cement

Superior Portland Cement Co., Seattle, Wash., was represented by a first aid team, recently organized, at the state safety contest held under the direction of the safety bureau of the state department of labor at Tacoma on August 10. The members of the team are Fred Baker, Ernest Lang, Walter Jungblom, M. Leonard, A. K. McClellan, Ole Nelson and E. M. Buchanan.

Marquette Cement Mfg. Co., Chicago, Ill., is reported to have found that the dust collecting system installed at its La Salle, Ill., mill besides functioning as a dust eliminator has aided in the evaporation of moisture in the plant, resulting in the screens passing their full capacity all of the time. and thus increasing the output. The dust collecting system at this plant was furnished by the Northern Blower Co., Cleveland, Ohio.

Beaver Portland Cement Co., Portland, Ore., has commenced construction of a new dam across the Rogue river at the site of the power plant, formerly owned by the city of Gold Hill, Ore., and recently acquired by the cement company. The new owners will spend approximately $200,000 in replacing the old diversion works and increasing the present hydro-electric power plant from 500 hp. to 3200 hp. The new works will supply power for the company's plant at Gold Hill.

Cement Products

Jack Franklin, secretary of the Wisconsin Concrete Products Association, recently purchased a new Hudson car, and spent his vacation driving through the east visiting products plants in New York, and New England.

Halifax Concrete Products Co., Daytona Beach, Fla., has obtained the manufacturing rights for the surrounding territory for "Stone-Tile" from the National Stone-Tile Corp., according to an announcement in the *Daytona Beach News-Journal*.

Monroeville Concrete Co., Monroeville, Ohio, has been bought by the Louis O'Connell Co. of Tiffin, Ohio. The plant at Monroeville will continue to make blocks and silo staves, but the manufacture of funeral vaults will be carried on exclusively at the Tiffin plant.

Lime

Snow Flake Lime Co., St. Johns, New Brunswick, a subsidiary of the Restigouche Co., Ltd., has bought a 50-ton Schulthess hydrate plant and will construct a plant within the city of St. John, under the management of C. A. Beatteay. The plant will be erected by the McGann Mfg. Co. engineers, and is expected to be in operation by January 1.

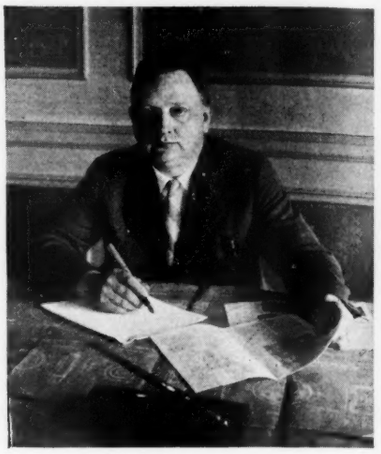
Abramson-Bode Corp., Lindsey, Calif., has made extensive improvements at its lime plant three miles from Lindsey. The old quarry has been abandoned, and a new one about 150 ft. lower down the valley has been opened, and a new tramway 650 ft. in length has been built to the plant to carry the limestone down by gravity.

Washington Building Lime Co., Baltimore, Md., has closed its lime plant at Strasburg, Va., due to the company's policy of cutting down overhead expenses. At present the plant is being dismantled, but if business conditions warrant, it will be opened again in the future. W. J. Flanagan, manager of the Strasburg plant, is to be transferred to one of the company's other plants at Bakerton, W. Va.

Personals

Charles H. Upson, for the past 23 years district manager for the Dodge Mfg. Co., has joined the sales organization of the Chain Belt Co., with headquarters at 909 Traction Bldg., Cincinnati, Ohio, and will represent the company in the sale of its line of chain and transmission equipment in the Cincinnati territory.

R. B. Randall, for nearly 20 years engaged in the clamshell and dragline bucket industry, has been appointed manager of the Pacific Coast division for the crane and shovel department of Link-Belt Co., Chicago, Ill. This company has opened



R. B. Randall

a San Francisco office in the Hearst Bldg., and Mr. Randall has assumed active management of the new office.

Alfred V. de Forest, research engineer for the American Chain Co., Chicago, Ill., was recently awarded the Dudley National Medal by the National Society for Testing Materials in recognition of his achievement in perfecting the non-destructive test for materials. Mr. de Forest's sensitive electric galvanometer, which in operation is comparable to the x-ray, will detect a flaw no bigger than a pinhead in the center of a large steel wheel, and all without cutting or marring the surface of the metal. The galvanometer may be applied to many uses, as for example the inspection of steam turbine wheels.

Obituaries

George Luety, president of the Beloit Concrete Stone Co., Beloit, Wis., died on August 13, following an illness of two years' duration. Mr. Luety was born in Germany 59 years ago and came to Beloit in 1891.

S. P. Dahlberg, chief chemist for the Union Portland Cement Co., of Denver, Colo., was recently killed in an automobile accident near Kemmerer, Wyo. Mr. Dahlberg, who had his office at the company's plant at Devil's Slide, Utah, was 45 years old.

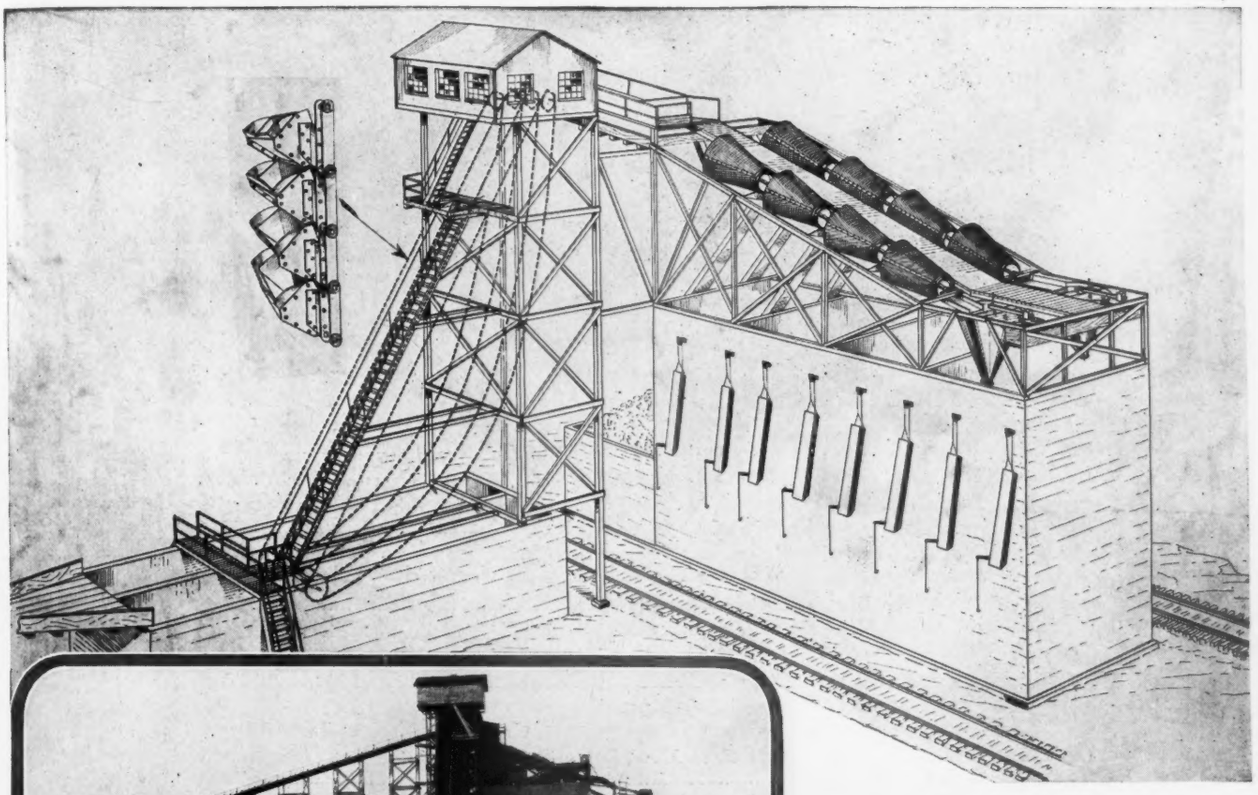
Manufacturers

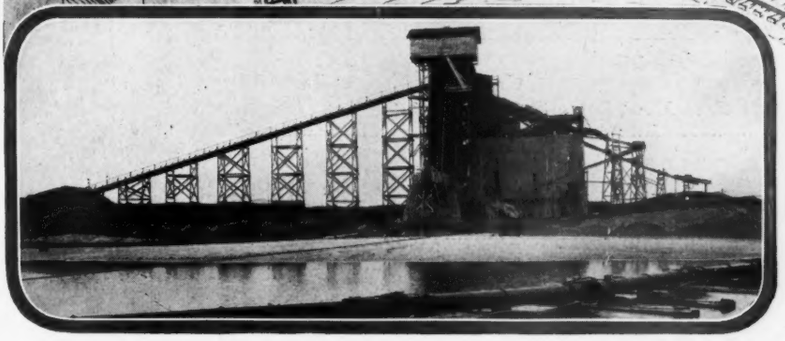
Universal Crane Co. announces the removal of its general sales offices from Cleveland, Ohio, to 28th and Fulton St., Lorain, Ohio.

The Chas. T. Topping Machinery Co., manufacturers of excavating machinery, announce the removal of their offices from the U B Bldg., Dayton, Ohio, to 4403 St. Clair Ave., Cleveland, Ohio.

Perfex Corp., Milwaukee, Wis., announces that at the last directors' meeting, Roger Birdsell, sales manager of the corporation, was elected to the directorate and made vice-president.

Combustion Engineering Corp., New York City, announces the appointment of W. O. Renkin as manager of the industrial furnace department. Mr. Renkin is well known as a pioneer in the application of pulverized fuel to metallurgical and industrial furnaces and has devoted the past 15 years to this particular field of engineering.





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Dull inclined conical screens remove the oversize and produce three grades of gravel. Link-Belt conical sand separators produce two grades of sand.

The digging elevator is used with pumping plants, to carry the sand and gravel from ground level to the top of the plant, keeping the discharge of the pump as low as possible, thus saving the considerable power which would otherwise be needed to pump against a high head.

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